WORLDS OF IF

MARCH 1977

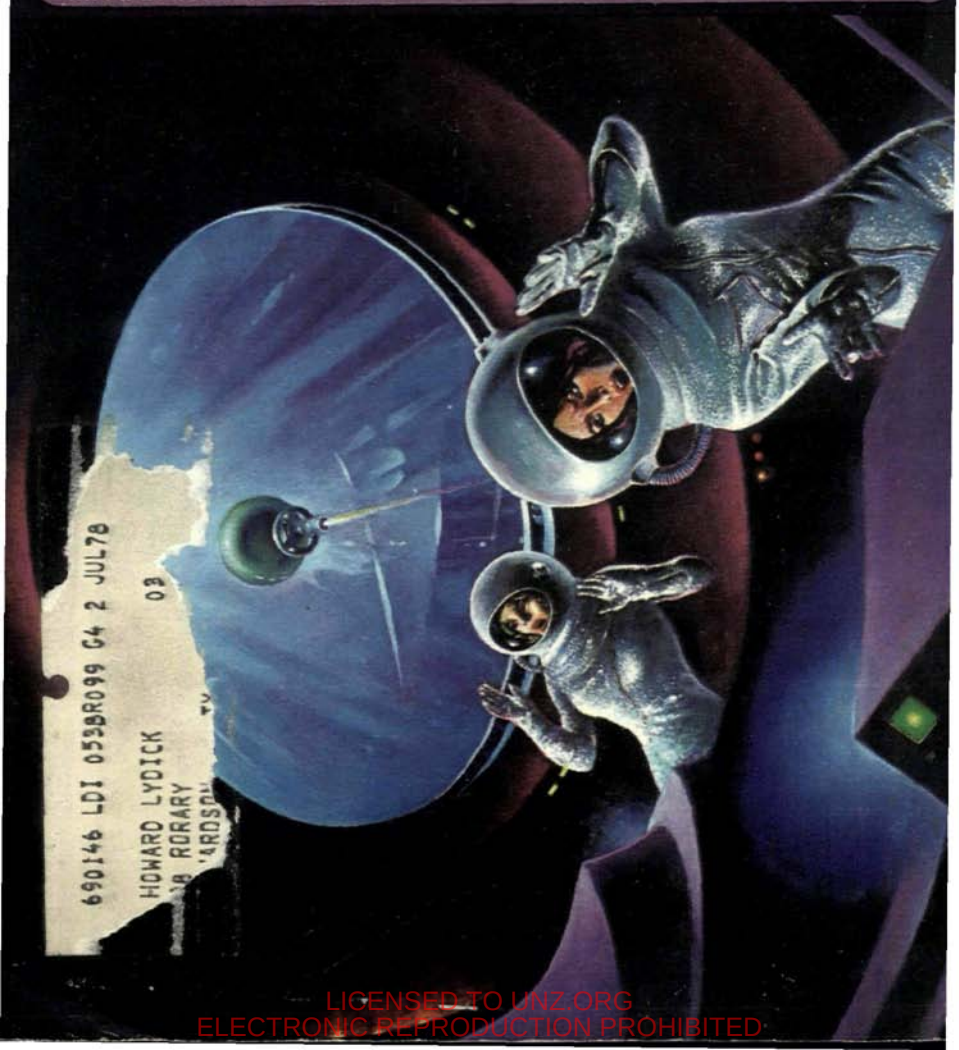
GALAXY

Science Fiction

FREDERIK POHL *GATEWAY* (conclusion)

Gordon Eklund Robert L. Forward J. E. Pournelle

M. A. BARTTER CHRISTOPHER IRWIN SPIDER ROBINSON



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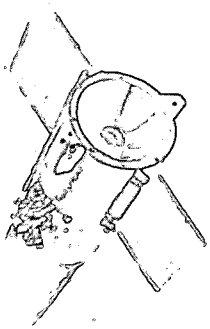

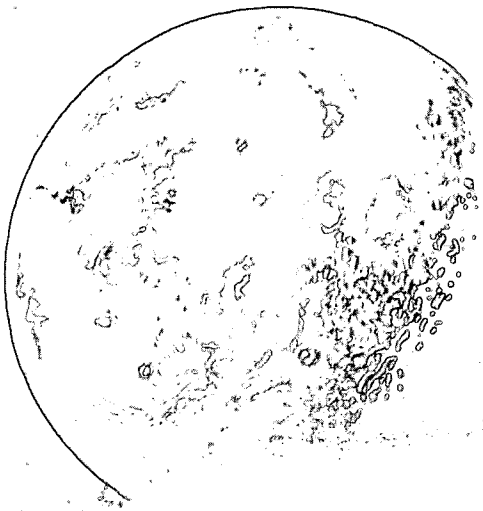

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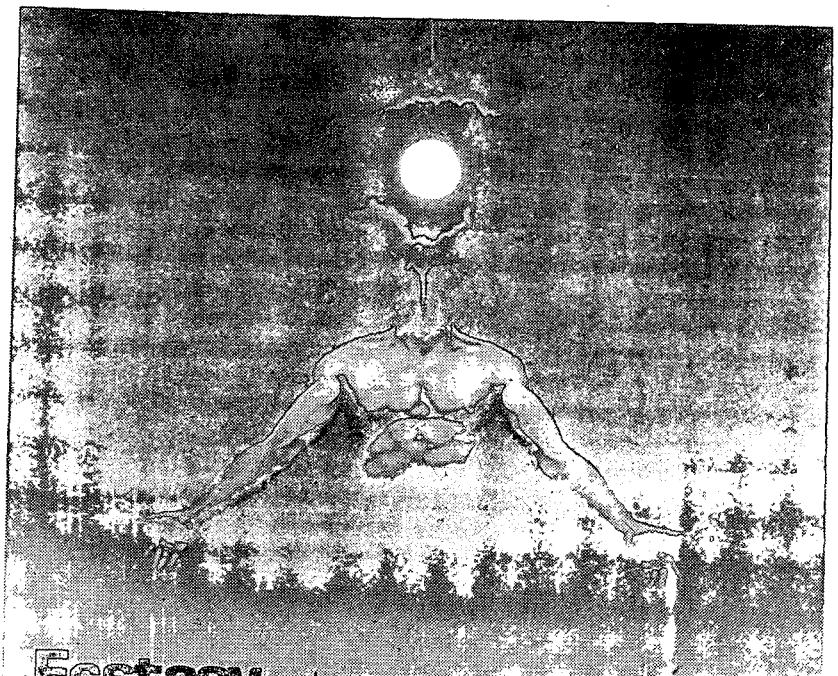

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March 1977
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Galaxy SCIENCE FICTION MAGAZINE

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Cover by Stephen Fabian, from GATEWAY
Interior illustrations by DiFate, Fabian, Freff, Gaughan, Sternbach

Errata: the front cover of the December issue shows the names of Robert L. Forward and Gordon Eklund. Both of these gentlemen appear in the March and not the December issue. *Galaxy* very much regrets the error.

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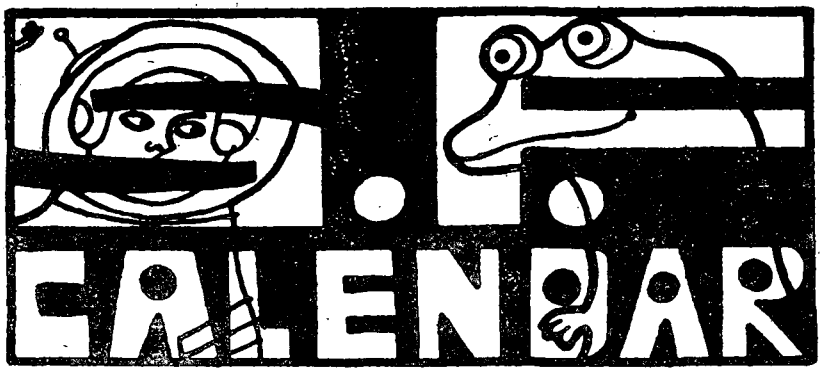

JAN. 21-23. Science Fiction and Occult Fair, Statler Hilton Hotel, Downtown New York City, New York. Tickets (per day): $7.75 before Nov. 21, $8.50 before Dec. 21, $9.50 after. For free info write: TriStar, Dept. G., 521 Fifth Avenue, N.Y., N.Y. 10017.

MARCH 25-27. TOTOCON. The first Kansas Science Fiction Convention. The University Ramada Inn, Anderson & 27th, Manhattan, Kansas. GoH: Joe Haldeman. Chairfan: jan howard finder. Registration: $5 in advance, $10 at the door. For info write: TOTOCON, P.O. Box 9195, Fort Riley, Kansas 66442.

JULY 1-4, 1977. WESTERCON 30, Totem Park Residence, University of British Columbia, Vancouver, BC, Canada. GoH: Damon Knight. Fan GoH; Frank Denton. Special guest: Kate Wilhem. Membership: $6 until July 5th. For info: WESTERCON 30, Box 48701 Sta. Bentall, Vancouver, BC, V7X 1A6.

AUGUST 26-28. DEEPSOUTHCON XV (B'hamacon), Birmingham, Alabama. GoH: Michael Bishop. Fan GsH: Charles & Dena Brown. Membership: $5 until ? For info write: Penny Frierson, 3705 Woodvale Road, Birmingham, Alabama 35223.

SEPT. 1-6,. 1977. SUNCON. 35th World Science Fiction Convention, Fontainbleu Hotel, Miami Beach, Fla. GoH: Jack Williamson. Fan GoH: Robert Madle. Membership: $7.50 attending, $5 supporting. For info: WORLDCON 35, Box 3427, Cherry Hill, N.J. 08002.

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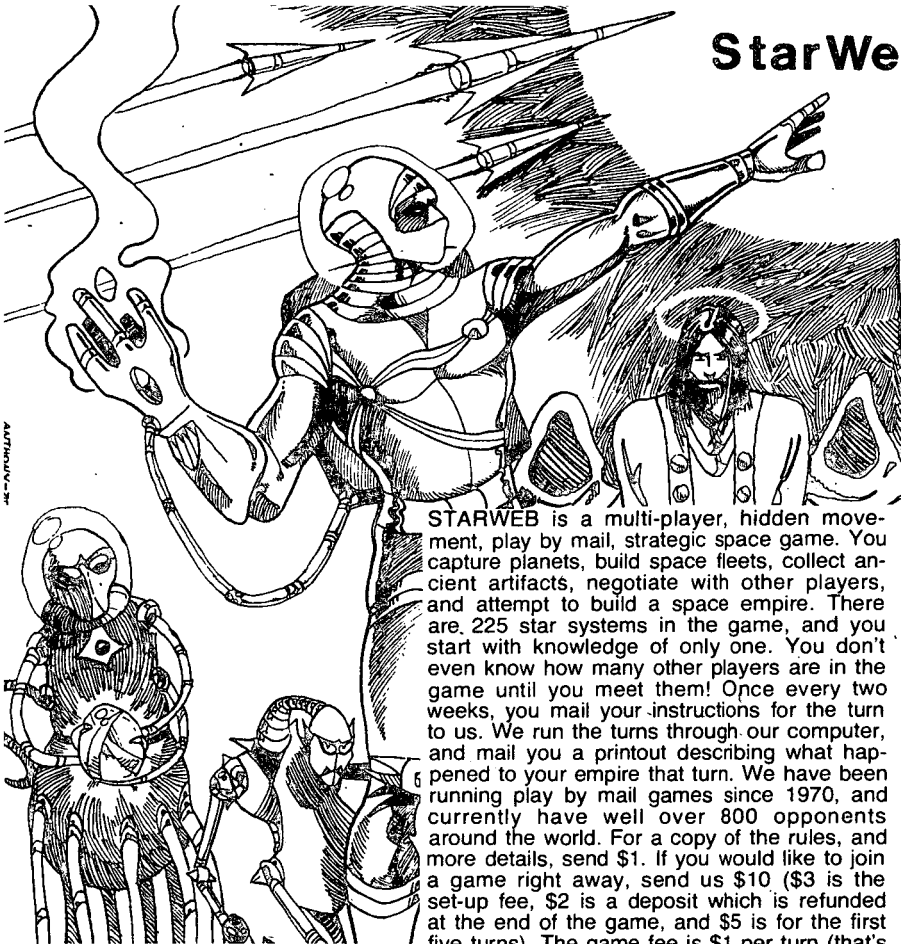
StarWeb



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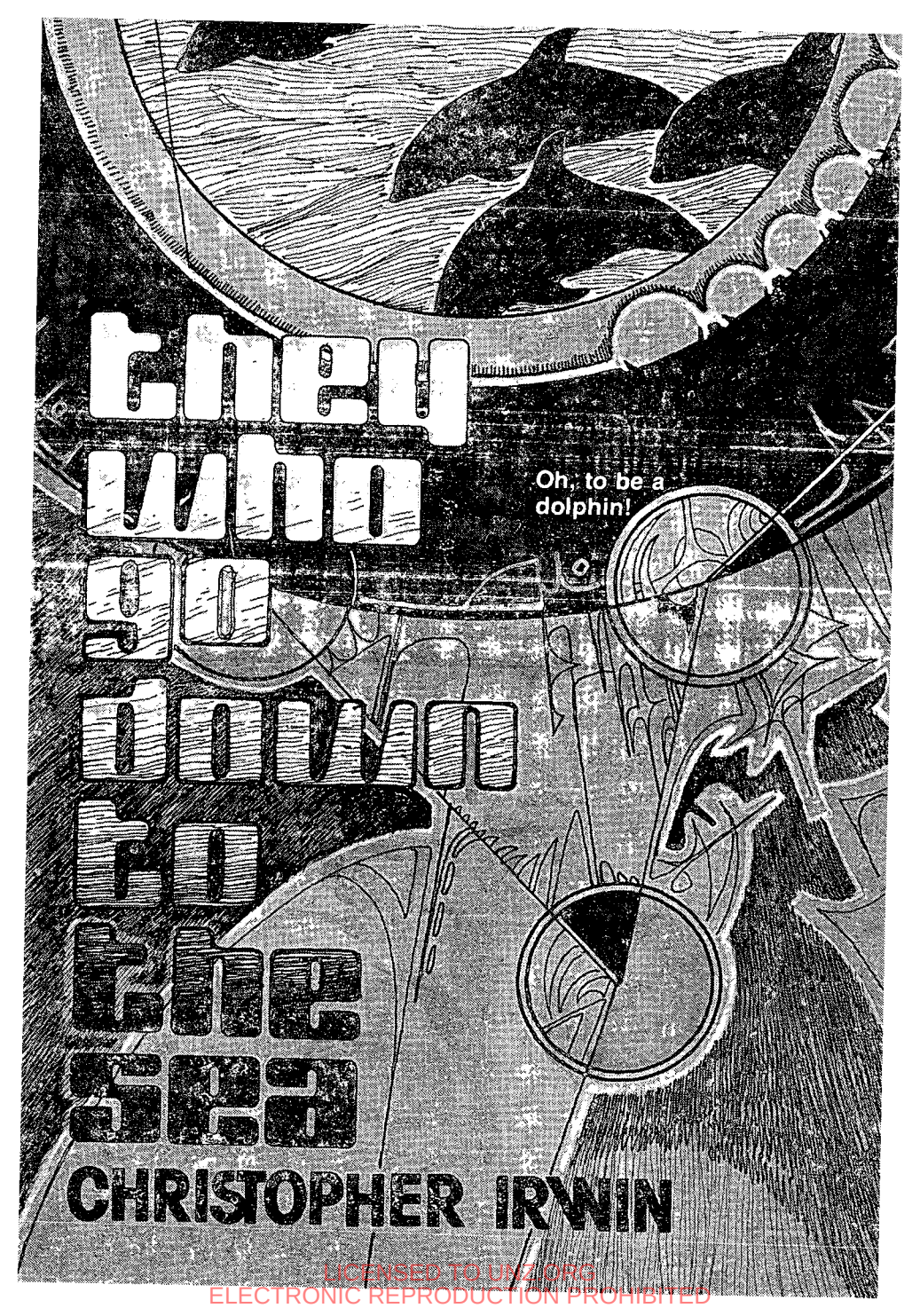

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THE SEA GLOWED rust-color under the copper sky.

Liz stepped from the cruiser onto the white hexagonal structure that represented the only surface dock of the underwater city. Nearby, waves lapped softly against the radio buoy that pointed up to the sky.

A young man took her luggage and escorted her to the open hatch of a small submarine that floated in one of the slot-like piers.

He did not introduce himself.

"Hi, my name's Liz Devlin. New World News Service. I believe Professor Eastlake is expecting me?"

"Sure," the man said.

"And you are—"

"Sorry. My name's Don. Don Carus. As you can see, I'm not used to meeting new people. Down below we're all used to knowing each other."

Suddenly self-conscious, he tucked his T-shirt into his jeans.

"Don't you ever go on land?" Liz asked.

"Not very often."

She climbed the metal steps to the hatch of the sub. When she got to the top, she stopped and looked out on the gleaming tropical sea.

"Hey," she exclaimed, pointing to starboard. "Are those porpoises?"

"Yes," Don said. "*Tursiops truncatus*—the bottlenose dolphin."

"Why are they swimming in a circle?"

"They're sleeping. This particular group does that all the time. They keep their right eyes open for about ten minutes, and then change position and keep only their left eyes open. Only half of their brains are asleep at any one time, and they can all keep watch."

"No kidding?"

"No, I watch them a lot. There are a lot of porpoises around here. They're almost a nuisance."

"Are you a marine biologist?" she asked.

"Computer programmer," he replied. "But the sea's my real love."

"How many of you are there down below?" Liz asked, climbing into the cabin.

"About two hundred," Don said as he stooped over to avoid hitting his head on the ceiling. "But they're building some new domes to accommodate more. Have a seat."

The contour chairs faced a curved glass window that looked out into the shimmering light of the ocean. Behind these seats were four more, obviously for passengers. Don strapped the luggage onto a chromium rack set to one side.

"How long can you stay with us?" he asked.

"A couple of weeks," she said. "After that, I'm scheduled to cover the latest war in South Africa."

"You get around," Don said.

"I try to."

Don pulled a lever on the control panel of the vehicle. A hiss of compressed air told her that the

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hatch had just closed.

"Don," she said, "answer one question now, before we go down there?"

"Sure. Fire away."

"What is going on? Why did Eastlake call this 'a matter of world concern'? I thought this was just an archaeological expedition."

"I'm not authorized to tell you any details," he said. "I haven't been told all of them myself. But what would you say if I told you that this expedition has turned up evidence that there were humans—or at least creatures that were structurally indistinguishable from ourselves—at least sixty million years before we thought?"

"I'd say you were crazy."

"So would the people who funded this project. That's why Eastlake wanted you to come."

Don pushed in the steering wheel and the sub tilted forty-five degrees nose down. Below them, in the dark green waters of the depths, Liz saw a cluster of glowing lights. She clutched the arms of her chair as they plunged downward from the gleaming surface.

"Living in three instead of two dimensions takes a little getting used to," Don said as he noticed her discomfort. "After a while, you'll get accustomed to thinking in terms of depth as well as distance."

"What's the pressure like down there?"

"The Center was built one hundred feet down off the main island. Actually, we're living on an underwater mountainside. The pressure of the water is about four atmospheres, but inside the domes you won't feel it at all because they're kept at surface pressure."

"Don't you ever feel uneasy when you think of all that water above your heads?"

"No, I love the sea."

"I don't know if I could live here," she said. "For any length of time, I mean. I think I'd mind being cut off from the rest of the world for very long."

"See that cable?" Don said, pointing to a long thread that extended from one of the domes up through the twilit water to the surface.

"That's our umbilical cord to the rest of the world—or what's left of it. It leads to the dish antenna you saw beside the dock. Our radio and TV network is linked via that antenna to the satellite communication system."

"I see," Liz said.

"Frankly, there are times I feel like cutting that cable."

The points of light Liz had seen from the surface now towered over her like huge glowing mushrooms. She could see people moving around inside the glass domes; large globes of light at the top of the structures provided the necessary illumination. In front of the colony of glass bubbles, wayward schools of fish glided by like silver clouds.

Don guided the miniature sub-

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marine to a port located at the bottom of one of the domes. Doors closed behind them; air jetted in as the water drained through grids in the floor.

"Here we are," Don announced. "Welcome to Atlantis II."

* * *

"I'm sure our home audience would like to know the significance of your find, Professor Eastlake. Would you elaborate on that a bit?"

The gray-haired man sitting between the panelists sat forward in his chair. He looked ancient and fragile under the blue-white lights.

"I hesitate to draw conclusions," he said slowly and dramatically, "when all the evidence is not yet in. Months—no, years—of careful study and evaluation will have to follow this excavation before we can say exactly what message these findings hold for mankind. But I can tell you this; we have already learned that all our previous views on human pre-history will have to be discarded. There is no doubt that these hominid remains are genuine, and that they date from at least the late Cretaceous period—roughly sixty-five to seventy million years ago."

"Professor," one of the panelists said, "excuse me for interrupting, but we have had hoaxes before. Like the famous Piltdown man at the beginning of the twentieth century."

"Are you accusing me of perpetrating a hoax?" Eastlake demanded sharply.

His questioner did not reply.

Nervous whispers filled the auditorium.

Don and Liz stood at the back of the large rooms and watched the interview. Heavy cables connecting TV cameras to tape decks snaked across the floor under their feet.

"I didn't want you to miss the panel discussion," Don said. "I'll show you to your room later."

"Who's on the panel?" Liz asked.

"Untrustworthy media," Don said. "The only news service Eastlake trusts is 'The New World.' He'll tell you more than he's telling those barracudas. But he won't tell you everything, I guarantee."

"Why not?"

"He says he doesn't want the news to be sensationalized, but frankly I think he's just milking this thing for all the drama it's worth."

"I don't like secrecy," Liz said.

"Professor Eastlake," one of the panelists asked, breaking the embarrassed silence, "you say these remains date from the Cretaceous period. Assuming they're genuine, as you insist, what kind of world did this distant ancestor of ours live in?"

"It was a world," Eastlake replied stiffly, "similar to ours in many respects, and yet startlingly different in others. First, the late dinosaurs had all but died out by

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the time of our earliest humanoid. The climate was growing steadily cooler. The flying reptiles of the Jurassic had evolved into creatures closely resembling modern birds. The swamplands that had sustained the dinosaurs were receding. Angiosperms had spread rapidly all over the earth. Much of the landscape must have looked strangely modern: specimens of maple, birch, and poplar have been found in many strata dating from this time. There were also early rabbits, turtles, and frogs."

"Paul," the one panelist said to the other, "geology is up your alley. Why don't you take it from here?"

"Glad to, Frank," the other replied. "Professor, how does continental drift fit into the picture?"

"Is this whole thing going to be televised?" Liz asked Don.

"Through most of the world satellite-com network. Eastlake never had so much glory. Look at him; he's eating it up. By the way, do you play chess?"

"What?"

"Chess. Do you play?"

"No."

"How about backgammon?"

"No."

"Do you play at all?"

"Shh. I want to hear the discussion."

"Then the continents looked pretty much the way they do today?" the panelist asked.

"Pretty much," Eastlake said. "Gondwana had broken into what we now call South America and Africa earlier, during the Jurassic. They may still have been connected at their northern extremity at this time, however. Also, North America and Europe were much closer together than they are now. It is my personal opinion that the Canary islands, where we are now located, were formed earlier than anyone has thought. Thanks to the underwater excavation techniques developped by Schaffer and Roth during the last five years, we've been able to investigate underwater beds previously inaccessible. Geologic dating has determined the age of these mountainous structures to be late Cretacean. The division of the super-continents into the separate plates caused much volcanic activity all over the planet. Judging from our recent evidence, the volcanic activity that formed these mountains was then followed by a very gradual subsidence. The small piece of continent comprising the homeland of our earliest human-like creature began to sink into the sea."

"What happened then, Professor?" one of the panelists asked. "What became of this species of so-called man? Why hasn't evidence of his existence been found anywhere else?"

"That, gentlemen," the old man said earnestly, "is the missing piece of the jigsaw puzzle. We cannot say for sure."

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"Could the sinking of the land have caused them to die out?"

"How many of them were there, Professor?"

"Could they have been limited to this vicinity?"

"Gentlemen, please, one question at a time," Eastlake said, holding up his hands in mock-surrender.

"First, we have found only one specimen so far—part of a jawbone. We have no idea how many there were. Second, we have no idea yet whether these proto-humans were in a direct line of evolution to us or not. Last, we don't know what happened to these creatures. Volcanic upheaval could have killed them off, the sinking of the land could have gradually flooded all the fertile land and destroyed all the plants and game that they fed on. It's still too early to say. At this very moment a team of archaeologists is out there searching for more data. When we discover more, we'll tell you. Have no fear about that."

"Professor," one of the panelists called out as the old man stood up to leave. "Professor, back in the 1950's, fossils, and I believe even meteorites, were found that had traces of certain protein molecules on them. Now, viruses are basically proteins, am I correct?"

"Yes."

"Is there any chance that one of the specimens you're unearthing could still carry traces of a virus that maybe wiped out the entire population of these early humans?"

Eastlake smiled.

"If you're suggesting that we may be unleashing an ancient plague on the earth once more, the answer is no."

"Is that a definite 'no' "?

"The chances of that happening are a billion—no, a trillion—to one. Now if you'll excuse me, I see our half-hour is up and I have some very pressing matters to attend to."

* * *

"This is your room," Don said, opening the door.

Liz walked in and looked around. It was surprisingly spacious; before coming here, she had pictured the dome's living quarters as being stuffy and cramped, like the rooms in old-fashioned submarines.

"Eastlake will be able to talk with you in a couple hours. Are you hungry?"

"No, thanks," she said.

"See you later then."

He shut the door behind him as he left.

Liz sat down on the edge of the bed and extracted her camera from her travel case. It was clear to her that something strange was going on here, and Don looked like a good source of information. She adjusted the camera for the light level in the room and took a picture.

It was a sterile-looking room. The few pieces of furnishing looked like they had been purchased from an economy motel: small dresser, wall TV, glossy Kodachrome print

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of a meadow full of red poppies. Suddenly she realized why the room was so bare; all the furniture had been brought laboriously from the surface, piece by piece. The far wall was hidden by a curtain. Pulling the cord that hung at one end she discovered that it was a window—a picture-window overlooking the undersea mountainside. She could see some of the other domes farther down the slope, glowing yellow-green in the darkening sea. The domes were connected with glass passageways that extended from the large main-dome like spokes on a wheel.

For a brief moment she felt an almost overwhelming sense of peace as she stood there looking out into the sea. It was so quiet there, so unbelievably quiet. The horrors and wars of the surface suddenly seemed as far away as the dark side of the moon. Here she felt protected. It was not an unpleasant feeling.

* * *

Eastlake's study looked like a bomb had gone off in a bookcase; piles of computer print-outs, books, and boxes of meticulously tagged artifacts cluttered every available surface. Liz sat on a leather chair by the Professor's large desk and took some pictures. A large tile mosaic filled the wall behind the desk. She had to use a wide-angle lens to get all of it in the viewfinder.

"That mosaic looks like pictures I've seen of the ruins of Crete," she said.

"The palace of Minos," Don said, "at Knossos. It was copied from one there. Eastlake liked the dolphin motif. Do you know a lot about archaeology?"

Liz shook her head.

"Only what I see on TV."

"Good for you. It's all a pack of lies anyway."

"Why so cynical?" Liz asked. "Don't you believe in the project?"

"If there's anything that this project's proved it's that archaeology's a pack of lies, a house of cards built on guesses made about a couple old bones and pieces of pottery. When a new piece of bone is discovered that doesn't agree with the guesses already made, BANG! All those brilliant theories are blown into a million pieces, and we realize we had it wrong all along."

"That's the way science is," Liz said. "You know that."

"All I can say is, it's a hell of a way to make a living."

"You sound like one of the Do-Nothings up on dry land," Liz said with a note of revulsion.

"Yeah, well don't act so superior. They have a point."

"Oh, sure," Liz exclaimed, "they're wonderful people—doing nothing but sitting around and watching tri-D TV, going to parties and drinking themselves to death—"

"Sounds good to me," Don interjected. "Come to think of it, that's

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exactly what this place needs—a party. Let's have a masquerade; we'll all come as our favorite fish."

"How can you talk like this? You, one of the few people in the world privileged to work on this project!"

"I could wear nothing but a sprig of parsley and a slice of lemon and come as a haddock dinner—"

"You're helping to broaden the horizons of knowledge."

"Hey, save that for your news service. I don't buy it."

Don walked over to the window. His face looked gaunt in the greenish light.

"We're just talking about making more guesses," he said slowly. "And time is running out, in case you've forgotten."

"But—"

"You must be Liz Devlin," a man's voice said behind them.

Liz recognized Professor Eastlake. He was carrying an armload of printouts and was wearing a spotless white lab coat and a red-and-black striped tie.

"Liz," Don said, rising. "Let me introduce you to the High Lama. Professor Eastlake, Liz Devlin of the New World News Service. Liz Devlin, Professor Eastlake. And now, if you'll excuse me, I have a program to run."

He nodded to the Professor and left.

"What's with him?" Liz asked.

"Hard to say," Eastlake said, shaking his head. "He's a strange bird."

"Why do you keep him on?" she asked. "He must be pretty disruptive for the project."

"We have no choice," the Professor said, sitting behind his desk. "He's a genius, and our chief of computer operations. You've heard of Von Aachen's lobe?"

"Yes," Liz said, "the enlarged area of the cortex of the brain. He has that?"

"Yes," Eastlake said, "for better or worse. I'm not convinced that mutation accounts for his intelligence, but it may account for his instability."

"But he's a genius?"

"Oh, yes," Eastlake said wearily, "and besides, when he began writing the programs for our system here he used a computer language of his own invention. Since he does his work adequately and it would be very expensive to duplicate his initial programs, he effectively secured his job."

"I don't care what he is," Liz said, "I don't like him. He's too cynical."

"Well," Eastlake said, smoothing back his wiry white hair, "these are cynical times. Speaking of which, what's the latest from above? I haven't had time to watch the news for weeks."

"Nothing's changed," Liz said, taking her tape recorder from her purse. "Things are as bad as they've always been. Maybe a bit worse."

"More riots?"

"All the time. They're not even news anymore. Another famine has broken out in North Africa. This one may be the worst yet."

"I see," he said, nodding gravely.

"The thing that bothers me, Professor, is that a lot of capable people are no longer willing to work toward a solution."

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"You can't blame them."

"I can blame them," Liz said. "I don't believe it's ever too late to find answers."

"Yes," Eastlake replied, "yes, of course."

"But, Professor," she continued, "I'm here to talk to you about your project. Do you mind if I record our conversation?"

"No, go ahead."

She placed the small machine on the desk between them and turned it on.

"Professor Eastlake, just what is it you've found here and why do you think it's so important?"

"Let me," the old man began, "answer the second part of your question first. Why do I think it's important? You might as well ask: why do I think archaeology's important. I will tell you. It is the only branch of science which studies interrelationships between human beings and the rest of the planet over long periods of time. And we have to know these things in order to understand what is happening to us now and what will happen in the future. This has always been important knowledge, and I don't have to tell you how much more important it's become in the last few decades. Now, as for what we've found: it is nothing less than conclusive evidence that there were human-like beings on this earth more than sixty million years ago. That's sixty times earlier than was previously thought."

"Professor, if that's true, it turns everything we've ever thought about our origins upside-down. Our subscribers will want to know why evidence like this hasn't come to light before."

"Come to light," Eastlake repeated, "that's the key phrase. The evidence had simply not seen the light of day before this—literally. Before we can study relics or remains, we have to find them. On land they may be turned up accidentally, say during road excavation, or they may be brought to light by the gradual erosion of a stream. But we do have to find it. And that is no easy job."

He rubbed his hands together as he spoke. The thick lenses of his glasses focused the glow of the overhead lamp into half-moons of light on his cheeks.

"Geologists at the Center here stumbled across some artifacts—"

"Artifacts!" Liz interrupted. "You mean like tools or weapons? I didn't know—"

"I'll explain that in time, Miss Devlin. Please. Geologists found these things accidently, while they were looking for undersea mineral deposits. Thanks to special techniques developed only in the last twenty years, we were then able to commence a careful and methodical excavation of this site. That excavation is proceeding at this very moment. We have teams of highly trained people working around the clock with mini subs and scuba gear."

"Around the clock?"

"Time is precious."

"But professor, it seems to me that some traces of these early humans would have been found before. I mean,

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fossils dating back to earlier periods have been found all over the world, haven't they?"

"True," Eastlake said, "but don't take these fossils for granted. Think of the enormous amount of time we're talking about. Think of it—sixty million years! It's amazing that anything survives that long, isn't it—considering the changes the earth goes through, all the tectonic forces it's subjected to. Also, don't forget that it takes very special conditions to create a fossil. They're almost always found in beds of rock formed from soft marshland or the soft ooze that settled on the floors of the early inland seas. If a variety of creature once lived only on the rocky slopes of mountains it's very possible that no fossil record was ever left."

"You're saying that's the case here?"

"All I can give you now is theories. Another theory is that these early homonids were few in number, and limited in geographical distribution. If that's the case, then the probability of anyone finding a trace of them sixty million years later is very, very small indeed. Especially if they cremated their dead, which they probably did."

"That's right. I forgot."

"There might be some traces of carbon and other organic chemicals in the soil," he added, "but these would be very hard to detect and evaluate."

"But tell me this, Professor, did we evolve from these early men?"

"Oh, no, highly unlikely. They were too early."

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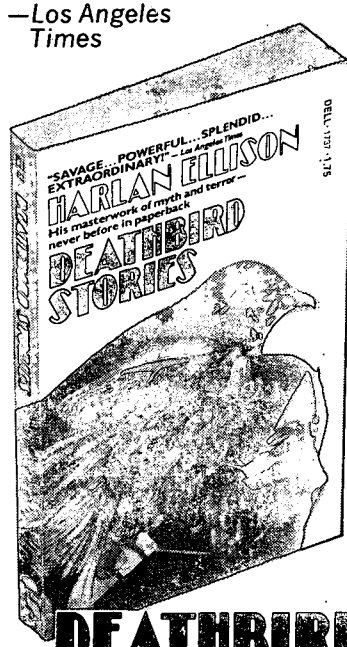
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"Modern man didn't appear until about a million years ago, right?"

"Judging by the evidence collected so far," Eastlake said cautiously.

"Then how did these early humans have time to develop way back then? Why did it take modern man so long to evolve?"

"Well, you know, simple duration of time isn't the only factor involved with evolution. There are a lot of factors which are only vaguely understood. Take the cockroach, for example; this insect has been on the earth practically since the beginning of life, and it's hardly changed at all up to the present time."

"Professor, you mentioned artifacts. What exactly are these artifacts?"

Eastlake thought for a moment before replying. The turning wheels of the recorder collected only the hushed whisper of the air conditioning as the old man stared at his desk. Finally he looked at her.

"I haven't told this to anyone from the outside yet. I felt the time wasn't right. But I trust you and your service to handle it carefully. The first object that was found turned out to be something resembling the blade of a knife. It was covered with concretion, and looked like a lump of fossil coral. The proton magnetometer, however, indicated that it contained metal, and X-raying it later revealed the object inside. I have it here."

He opened a drawer of the desk, and produced a small piece of metal.

"Amazing," Liz said as he handed it to her. "It *is* a knife blade. That means these early men were intelligent. That's incredible!"

"Be careful with that word 'intelligent,' " Eastlake warned. "I called you here because your news service has a reputation for sobriety. I don't want a lot of cranks on the surface to start braying 'Atlantis! Atlantis!' As far as I'm concerned that whole business is just a myth recorded by Plato from some bronze-age folk tales about the continent of America. Nothing more."

"Professor, just what kind of metal is this knife made from?"

"Steel, Miss Devlin. That artifact is sixty-million-year-old steel."

* * *

It was late, and the lounge was empty except for Liz.

She paced back and forth, haunted by insomnia, while all but the night shift of divers slept. What Don had said about Eastlake bothered her; Eastlake's bickering with Don bothered her. The place in general seemed to be overshadowed by some vague fear, and the excitement of discovery was diluted by this shadow. She could sense that not all was right.

The TV flickered on the wall.

The last person to leave the room had forgotten to turn it off. A news program about the surface was going on unnoticed.

Early the next morning, Liz was awakened by the sound of running footsteps in the hall. Groggy from

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practically no sleep, she dressed as fast as she could and grabbed her camera. Out in the hall she spotted Don. He was wearing blue jeans and looked like he hadn't shaved in a couple of days.

"Hey, what's going on?" she called out to him.

"The last team of divers brought in a lot of artifacts," he said. "Come on, I'll show you the lab."

"I thought you weren't interested in this 'serious' work," she said, walking briskly beside him.

"Anything to break the monotony," he said. "Even work. Besides, I have to run the statistical programs."

The lab was crowded with dozens of people, each intent on a different task. Eastlake sat at a long table, bent over a stereo microscope. An assistant was holding what looked like a piece of rock against the rotating blade of a circular saw.

"Don," Eastlake called out, "it's about time you got here. Would it be asking too much for you to do your job? We need some statistics analyzed."

"Right away," Don said, saluting.

He walked over to a computer terminal and started to key some directions.

"Mr. Hsiung," Eastlake said, "do you have that thin-section ready yet?"

The man at the saw shook his head.

"It'll be a couple minutes yet."

Not wanting to get in the way, Liz walked quietly around the room and took some pictures. In a few moments, she felt a tap on her shoulder. It was Don.

"How about some coffee?" he asked.

"Yeah, sure. I'd love some."

He handed her a chipped china cup full of rich-looking coffee. It smelled great.

"It's real," he said.

"How'd you manage that?" she asked, taking a sip.

"Government research has its privileges."

"What do you think of the lab?"

"I'm impressed."

"All paid for by people who haven't the faintest idea what it's being used for."

He drank some coffee.

Behind him lights on one of the computer consoles were blinking on and off in shifting patterns of red and green.

"What's it doing?" she asked him.

"Statistical analysis of the position where the latest artifacts were found," he replied. "The position of each was measured against a wire grid by the divers and recorded on a waterproof slate. This information was encoded on tape and fed into the memory banks a little while ago. I just had it start a program to determine whether the distribution of these objects was random or not."

"What will that tell?"

"It'll tell us whether the objects came from the same time period, or whether the site has been contaminated by shifting in the bedding planes."

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"What exactly are these artifacts they found?" Liz asked him.

"Bricks," he said. "Looks like part of a foundation."

* * *

The two of them floated in the green water over the excavation site. They watched the soft light that filtered down from the surface play on the reef below. The divers, in their black wetsuits, looked like tadpoles.

"I'm glad you could take me to the site," Liz said, staring out the window of the mini-sub.

"Don't mention it," Don said.

"What are they doing now?"

"See that machine off to the right?"

He pointed to a rather large machine bristling with hoses and pipes. It made a pinging noise in the sub's sonar, like the sound of moving pistons or gears.

Liz looked at it and nodded.

"That's what makes underwater excavation like this possible. It's basically a pump; it's connected to a fine matrix of pipes bedded around the trench they're digging. It siphons off the turbidity raised by the trowels."

"Do you think they'll come across any more human remains?"

"We may find something. Who knows? Sixty million years is a long time."

"Isn't it strange," Liz said, "that they've dug all those trenches and found only a couple of bricks and a piece of bone."

Don shrugged.

"Hey, look. There's one of my friends."

"Who—"

And then Liz saw the dolphin off the port side. It shot over the excavation site and made playful circles over the heads of the divers.

"You mean that porpoise?" Liz asked.

"The divers have given him the name 'Diomedes.' You can tell him from the others by the little nick taken out of his dorsal fin. His real name is 'Ikikee.' "

"What do mean 'his real name?' "

"That's what he calls himself," Don said. "A little while back I was trying to talk to it over sonar. I kept saying 'Don' and it kept repeating the sound 'Ikikee' over and over. When I finally said 'Ikikee' over the sonar, it replied with a sound that roughly approximated 'Don.' I assumed 'Ikikee' was his name."

"That's ridiculous."

"They're smart critters," he said. "Don't sell them short."

"The navy gave up their dolphin experiments long ago," Liz said. "They concluded they were no more intelligent than dogs."

"If a human judges intelligence, he's going to use himself as a model. If a dog judges intelligence, he's going to use himself as a model. The navy researchers didn't

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find intelligence in dolphins simply because they were looking for the wrong thing."

"Oh, I see," Liz said sarcastically.

"You don't believe me?"

"I didn't say that."

"You know their brains are about the size of ours, with the same complicated neural exchanges we associate with abstract reasoning."

"If they're so smart," Liz said, "why are they still doing nothing but swimming around and eating fish?"

"What would you like them to do?" Don smiled.

"Well, something—something creative."

"They have creative play. And they have a complex social organization and a lot of sensitivity to each other. Look at Ikikee there trying to relate to that diver."

The dolphin was nudging one of the archaeologists with his snout, and then bolting away, as though trying to start up a game.

"Look at him," Don said. "See how he's trying to communicate?"

"Just like a dog with a rubber bone," Liz replied.

"You just haven't lived with them long enough. Just wait til you've been down here a while. You'll see how human they are. So human it's almost scary."

"Eastlake told me you were spending too much time with these pets of yours. I believe him."

"Oh, yeah?" Well Eastlake could tell you a few things about dolphins too, if he wanted to."

"What is that supposed to mean?" Liz said with the sharp edge of a reporter's voice.

"Nothing," Don said.

"No, come on. Why did you say that?"

"He's had some interesting experiences with them, that's all. You can't help interacting with them here because you live among them. Eastlake just doesn't like talking about them because he's secretly afraid they're smarter than he is."

Liz laughed.

"Want to hear a story?" Don asked.

"About what?"

"About a near cousin of our friend here—the orca."

"Orca?"

"The so-called killer whale."

"Sure, go ahead."

Don sat back in his seat and rested his hands behind his head. He looked off into the miles of water as he spoke.

"The Indians of the Northwest have a lot of stories about whales. One of them goes like this: once—not too long ago—a couple Indians were out fishing a little distance off shore. It was growing late, a cold wind was blowing off the sea, and they were growing restless. It was then that they spotted an orca swimming not far away. Out of boredom as much as anything else, they paddled closer to the gleaming black and white body of the crea-

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ture. When they got within a hundred feet of the orca, one of the Indians threw one of the stones they used for weighting their nets at the whale. It hit the orca on the dorsal fin, and the whale then plunged under water and headed toward land. A little later these same Indians saw smoke from a campfire trailing from the shore. They grew curious about it, and went in to investigate.

There they saw a large canoe near where the orca had been headed. A giant of a man sat by a fire and glared at them. 'Why did you throw stones at me?' the man asked. 'You damaged my canoe. Go into the forest and get some bark to fix it.'

The Indians did as the giant directed, and when they had patched the hole in the canoe, the man told them to hide their eyes while he left. After a few minutes had gone by, however, the Indians took their hands away from their eyes and saw the man leaving in his canoe. As he got beyond the breakers, they saw him no more. All they saw was a large orca heading out to sea.''

During the pause that followed the story, a gentle swell rocked the sub.

''It's a nice story,'' Liz said.

''And a very common one,'' Don added. ''Examples of it have been collected among peoples all over the world. Some tribes in Alaska still carve figurines that show a man inside a whale's belly.''

''Jonah,'' Liz said in a tone of recognition.

''It's one of mankind's oldest stories,'' Don said. ''The origins of it are lost in the stone age.''

Liz looked out the window again.

''Look,'' she said suddenly. ''One of the divers is holding something.''

* * *

''It's a skull!'' Eastlake announced, clasping his hands together in triumph. ''We've finally got something people will take seriously.''

He walked over to his desk and pressed a button on the intercom.

''Tell Winters to bring in the skull. I want to brief Miss Devlin on the latest developments in our search.''

Liz took out her recorder and placed it on the desk.

''At last I can tell your readers something worth listening to,'' he said.

''This is what Don and I saw unearthed this afternoon?''

''Yes,'' Eastlake said. ''It was found in the same bedding plane as the other artifacts. Our preliminary tests confirm the geologic dating. It is roughly sixty-five million years old, plus or minus a thousand years.''

''What do your tests consist of?'' Liz asked.

''You really want the details?''

''In layman's language,'' Liz

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said. "Our subscribers will want to know everything."

"Okay," the Professor began, sitting down, "here is what we've done. We used several dating methods. One, the fission-track technique, can date materials such as certain types of glass and crystalline minerals accurately for ages between twenty years and a billion years. In short, what happens is this: the spontaneous fission of uranium-238 through time causes microscopic damage trails in these materials. The more tracks there are, you see, the older the object is. A sample of the material in question is exposed to a controlled amount of thermal neutrons. The number of tracks this produces allows us to adjust our count for the varying amounts of uranium found in different samples. Our samples here were some quartz objects—possibly ornaments—found near the knife blades."

"Did you use carbon-14 dating?"

"No, no," Eastlake said, "the half-life of carbon is only about 5,568 years. So at ages beyond sixty thousand years the amount of error becomes so great that the technique is useless. Likewise, potassium-argon dating is practical only up to three million years. This project has posed special problems. Naturally, geologists have examined the materials comprising the bedding planes and established relative dating that has supported the abso-

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lute dating provided by our fission track method. As a further test, we have analyzed the fluorine content of the skull and found it almost identical to that of the piece of jawbone we had found earlier. Though the jaw didn't belong to this same skull, the two are about the same age. The greater the length of time bones remain in groundwater laden with fluorine ions, the higher the percentage of fluorine in the fossil."

"Professor," Liz said, "how large a brain did this early human have?"

"The cranial cavity of this specimen indicates . . . ah, here's Winters with the thing now."

A young man came up to the desk holding something that looked like a brown stone.

"Hello, Miss Devlin." "I understood you're from the press."

"Hello," Liz said.

"Put the skull there," Eastlake said, pointing to a clearing he had made on the desk.

"The cranial cavity of this specimen indicates that its brain must have weighed about 1500 grams. The average weight for a modern human brain is about 1400."

"Does that mean this creature was more intelligent than we are?" Liz asked.

"Not necessarily. Both the largest and the smallest human brains ever measured belonged to idiots."

"It looks human," Liz said.

"I firmly believe it was human," Eastlake said. He picked up the skull and contemplated it, Hamlet-like.

"But what happened to these people?" Liz asked.

"Again, I cannot answer that yet," the old man said with a professorial tone of voice. There just isn't enough evidence. However, off the record—"

Liz turned off the machine.

"Off the record," he continued, "I can give you some personal thoughts of my own."

"Please," Liz said.

Despite our similarity, I don't believe we have descended from these creatures. Evolution probably was only parallel."

"What do you mean?"

"We seem to have evolved from Australopithecus, a small, vaguely human creature that evolved via old-world monkeys from certain prosimians at a time when they were about mid-way in their development. This was about forty million years ago. Prior to our discovery here, the earliest near-human remains known dated from about three million years ago. Now, prosimians first appeared a full 136 million years ago. So, the time span from the point where prosimian became ape-like and the point where we humans are now is about forty million years. If, for some reason, a variety of yet-undiscovered proto-ape branched off from the prosi-

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mians at the *beginning* of their development—as well as in the middle—our earliest human here would have had no less than sixty million years to evolve into what he was. That's twenty million more than we had."

Professor," Liz asked, "could the memory of this earlier race be preserved in certain myths?"

"You mean the Atlantis myth?"

"And others like it—the Golden Age myths, the Garden of Eden. Variants of it are found all over the world."

"Improbable. The time span is much too great."

"But if some of this race did somehow survive whatever catastophe seems to have happened to them, they might have evolved into present man. And we might have retained some racial memory of them."

"So far, no conclusive evidence for racial memory has ever been produced."

Liz nodded.

"In fact, if you're going to speculate that wildly," Eastake continued, "You've got to consider absolutely all logical possibilities—including the possibility that these creatures had an extra-terrestrial origin."

* * *

Night had come to the sea.

The shallows of the reef were now as black as the endless night of the abyssal plains that stretched out below them. Liz stood by a curved-glass window in the main dome and watched the alien-looking sea grass wave slowly back and forth in the glow of the underwater lamps. Suddenly, behind her, the blast of a trumpet dynamited the silence.

"God, don't you hate rainy days?" Don said, fingering the valves on the trumpet. "What we need is music."

"Don," Liz said calmly, "has anyone every told you you need help?"

"No," Don said drunkenly, "just music."

"Maybe a vacation."

"Liz, want to know a secret? I like working here more than any of these . . . these zombies you see walking around in white coats. I get more of a kick out of it, I'll tell you that. Yessir."

"I don't believe that, Don," she said.

"They don't have fun with it. I do."

"Oh?"

"Anyway, who are you to be telling me what I like and don't like? EVERYBODY IN THE POOL!"

"Don—"

He held the trumpet to his lips.

BLA-A-A-A-A-A-T.

* * *

Only one technician, a young In-

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dian man, remained in the lab, the rest having apparently gone to dinner. He stood by a large device that looked like a huge magnet wound with about a million turns of wire. A quivering waveform shifted on the screen of an oscilloscope on the bench.

Liz approached him quietly from behind.

"Hi," she said suddenly.

"Oh!" the young man exclaimed. "You startled me."

"Sorry."

"That's okay."

"My name's Liz Devlin. New World News."

"Yes," the man said, "I saw you earlier, taking pictures."

"Right. Say—may I ask you what you're doing?"

"Uh, why?" he asked.

"Well, I'm interested in everything thats going on down here, but I don't know about science. Could you tell me what this instrument does? What's that thing in the magnet there, or whatever it is?"

"I don't know how much I'm allowed to tell you," the technician said.

"Don't worry," Liz told him. "Professor Eastlake gave me complete clearance. You can check with him if you like."

"No, I believe you," he said.

"By the way, what's your name? I'll need it for my article."

"Govindrapali," he said.

"How do you spell that?" She pretended to write the name down in her notebook as he spelled it for her.

"Now, what exactly does this complicated-looking machine do?" she asked in her most naive tone of voice. "It must be very hard to use all these intricate devices."

"It's a magnetmeter," he explained, pointing to the massive instrument. "I'm analyzing a piece of brick that was found at the site."

"Oh, yes," Liz said, "I heard about it."

"Well, you see, when clay is fired in a kiln, it acquires what we call remnant magnetism. The particles of iron in the clay become magnetized by the earth's magnetic field where the clay is fired. This machine measures the inclination and declination of the particles in the artifact."

"Really, and what does all that mean?"

"Well, we have records of the inclination and declination of the earth's field all over the planet, and of how it changed through time. We got those by analyzing core samples with this same machine. That way we can tell exactly where on the earth a particular piece of clay was fired."

"And have you found out where these bricks were fired?"

"Um, yes," the technician said. "And that is a very curious thing."

"What do you mean?"

"Unless our measurements are wrong, this brick must have been made about where the continent of

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Asia is now. Even allowing for the drift of the continents, that would mean this brick was made far away from where it was found."

"And yet it's just as old as the other artifacts?"

"Oh, yes."

Liz looked at him.

"But that would mean that this isn't the only place where this early man lived."

The technician nodded nervously.

"Yes, yes, that would certainly seem to be the case."

* * *

Sitting at his desk Professor Eastlake was almost hidden by a still-growing stack of print-outs and progress reports. He was holding the phone with one hand, a chicken-salad-and kelp sandwich with the other.

"More bones?" he asked with his mouth full. "Good. Don't forget to remind each diver to tag them with labels. I want the exact grid location written in waterproof ink on every fragment, every chip of pottery, every nut and bolt they dig out of the ground. Yes, that's right; if it's too small to tag, use the plastic vials. And this time have them include some soil samples with every find, in case the salt water washes off the datable material."

In preparation for this session, Liz was flipping through the stack of note cards she had accumulated during her five days at the Center.

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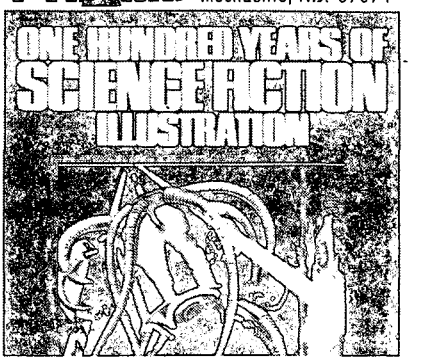

Eastlake put down the phone and rubbed his eyes.

"Professor," she said, "You can't have had more than ten hours sleep the last three days."

"Can't be helped," he said. "Now, what can I do for you?"

"I'd like to know if any new evidence has turned up."

"No," the old man said, "not yet."

"But I heard that those bricks that were uncovered weren't made in this location."

Eastlake looked at her for a moment, startled.

"Oh, yes, that," he said. "Actually, I was going to get around to

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telling you about that later today, when more pieces were fitted into the puzzle. I hate being premature."

"Of course."

"Who told you that, by the way?"

"What?"

"About the bricks?"

"I don't know his name," Liz lied.

"Oh, well, it's very simple. They were fired somewhere in what is now Asia."

"That means that there were others—maybe all over the world."

"We can't say that," Eastlake said cautiously. "They may have been just an isolated colony. In any case, it does seem that our earliest man—let's call him archaeohomo—did do a bit of travelling in the late Cretaceous."

"Were these bricks part of the foundation of a building?"

"Maybe not a foundation. Probably part of a building, though."

"Professor, if these people had the means of travel why didn't they just move to another area instead of dying out as they apparently did?"

"Impossible to say now," the Professor said. "There may have been no other suitable areas for various reasons, or it could be that by the time it became necessary for them to migrate they had lost whatever technology they had had. Also, don't forget: the more complex a society is, the harder it is to move it. People living in tents or caves have no trouble being nomadic. Think how hard it would be to move any modern urban capital. The truth is, we may never know exactly what happened to them."

"What else have you found out?"

"We know that the climate of this area was then mild. The temperature of the sea averaged about seventy degrees."

"Professor, how in God's name can you know that?"

"Again, by a method perfected back in the sixties—oxygen isotope analysis. You see, in sea water we have measurable quantities of two kinds of oxygen isotope—O_{16} and O_{18}. O_{18}, being heavier, naturally doesn't evaporate as fast as the O_{16} for any given temperature. By measuring the ratio of O_{18} and O_{16} left in fossil shells, we can determine within a few degrees what the ancient temperature of the sea in which they formed was. It's a lot easier to explain than it is to do, but the procedure is very reliable."

Liz was busily taking notes.

"Furthermore," he continued, "we know that, ecologically, this area was similar to what it is now. We have been extremely lucky in finding some fossil pollen—enough to do a rough sort of statistical analysis. We know that approximately a third of the surrounding land area was covered with various kinds of conifers. About a third was covered with a variety of grains. Most of the traces are unrecogniz-

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able, but at least one looks like a forerunner of modern barley. It's a good guess that they practised some cultivation, although, judging from the bone remains in their middens, their main diet seems to have been fish. The other third of the land must have been bare rock or deciduous trees."

"And they knew how to make steel."

"Yes," Eastlake said, "and that means they had some source of high energy."

"Coal?"

"No, too early. What it could have been we have yet to determine; we've uncovered no lead deposits that would suggest ancient uranium usage. We just don't know."

* * *

Liz set her tray down beside a young woman wearing a white uniform. The cafeteria was noisy; sound seemed to reflect off the curved ceiling and focus in the center of the room, amplifying background conversation into a roar.

"Hi," she said to the woman. "Mind if I sit here?"

"No, go ahead."

"I see you're a nurse," Liz said, sitting down beside her.

"Yes. I work in the clinic. You're that reporter, aren't you?"

Liz nodded.

"Liz Devlin."

"I'm Anne Sloane."

Liz opened the container of yogurt she had chosen for lunch and began to stir it.

"It's synthetic," Anne said.

"The yogurt?"

"They make all the food here, from algae."

"I see."

"It's not bad, though."

"Anne, what's it like working here?" Liz asked informally. "Does the clinic handle a lot of cases? Are there many accidents?"

"No," the woman said, sipping what looked like lemonade. "Once in a while a diver will need decompression. Most of them are archaeologists, you know. Some hadn't had a lot of diving experience before they started to work on the project. Now and then one of them gets the bends."

"How do you like living down here?"

"I sort of like it," she said. "I don't think I'd like to spend the rest of my life here, but for a while it's okay."

"What don't you like about it?"

"Oh, I don't know," Anne shrugged. "I guess I miss the movies most of all. They show movies here but most of them are pretty old. It's kind of like a summer camp, you know? Did you ever go to one of those when you were a kid?"

"But there's TV here," Liz said.

"Oh, sure. But I like going out, you know what I mean? Another thing is—I know this isn't really

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important—but people down here are pretty dull. They don't like going to parties much or anything. Except Don."

"Don Carus?"

"Yeah, I like Don."

Liz looked at her.

"Nothing, you know, romantic or anything," Anne added quickly. "He's just fun to be with. In fact, he's the only person down here I can have a good time with."

"Really?"

"Yeah. The others . . . they always seem to be thinking about something. There's always something on their minds. You know what I mean?"

Liz nodded.

"Don and Professor Eastlake seem to argue a lot," Liz added, watching Anne's eyes carefully for a reaction.

"Oh, yes, it's terrible," Anne said with genuine concern. "It makes us all feel very uncomfortable sometimes."

"Does Don have a bad temper?"

"I guess both of them do. They're both very smart."

"I see."

"I respect Professor Eastlake a lot," Anne continued, "but he's . . . he's—"

"Stuffy?" Liz said.

"Yes," Anne nodded. "He's always calling Don a Do-Nothing."

"Is he?"

"Maybe," she said. "But then, he's here, isn't he? That means something. And they say there's not much that can be done to save things anyway, you know. That's a fact. I guess I'm sort of a Do-Nothing myself; I want to have a good time while I can."

* * *

"They like Bach most of all," Don said. "Must be because his sound patterns are the most complicated of any of the composers I have on tape." He pulled another casette out of the rack and placed it on the player.

"You think they enjoy it?" Liz asked. "Or do they just think it's the sonar of some other animal?"

"J.S. Bach's sonar," he said. "And there's no doubt about it; they enjoy it. Porpoises are the most fun-loving animals on the face of the earth. Look at them out there. They haven't a care in the world."

Liz looked out the curved window of the lounge. A school of porpoises was performing a sort of boisterous ballet in the flickering light of the water. Now and then one of them would glide over to the underwater speaker mounted outside the window and float there motionless for a few moments, as though listening to the music.

"When I mounted the sonar unit out there," Don said, "I did it out of boredom. I didn't know if anything would happen or not. But it was a real success. Not only did I learn that porpoises like music, I

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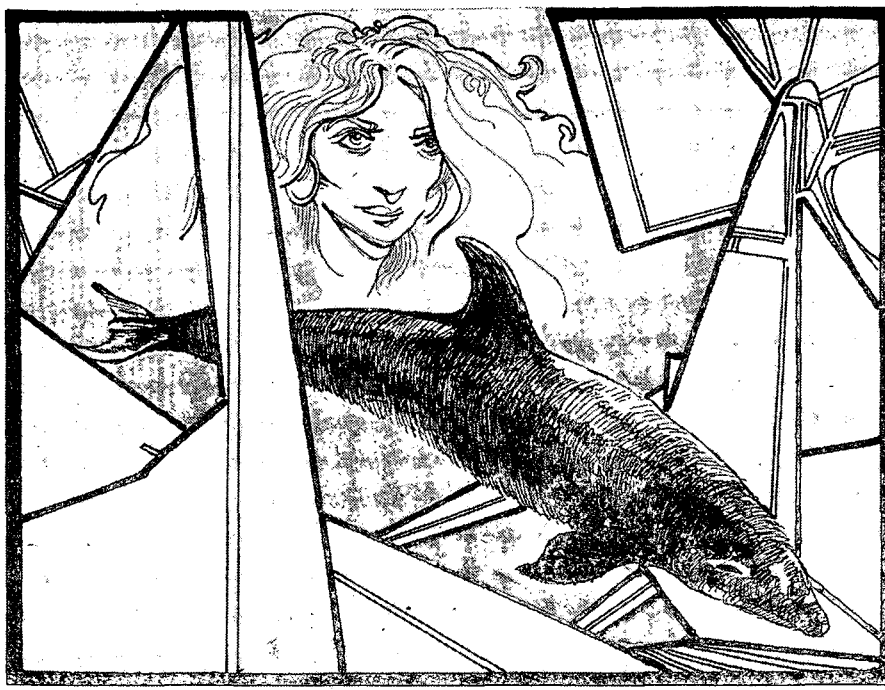

found out that some show a preference for different composers."

Liz looked at her watch.

"Maybe I'd better get back to the lab," she said. "Something new may have turned up."

"Relax," Don said. "It'll wait for you. You know, you could take a few lessons on relaxation from these dolphins."

Liz sat back in her chair. The dolphin outside seemed to be watching her.

"What range of notes can they hear, anyway?"

"They can hear tones between 75 Hz and 150 KHz, while we can hear frequencies from 20 Hz to about 20 KHz. Their hearing is most acute well beyond our range. That's one reason why attempts to communicate with them have been so frustrating."

"You don't still believe that they have a language, do you?"

Don looked out the window in silence, smiling faintly.

"Maybe they don't have a language," he said finally. "Maybe they don't need one."

"What do you mean?"

"Look at it this way: would *we* need a language if we could read each other's minds?"

Liz laughed out loud.

"Now you're telling me porpoises are telepathic?"

"Sonar," Don said seriously. "These creatures live in a world of sound. They hear with their bodies,

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and can emit clicks and chirps of sonar anywhere from ten to one-hundred millionths of a second in duration and up to six hundred of these pulses a second. This sense of theirs is so highly developed that they can distinguish between steel balls two and one-eighth and two and one-half inches in diameter, and between copper and aluminum disks of exactly the same size. In fact, their sonar is better than the sort of medical sonar equipment we use to locate tumors and stoppages of blood flow."

"In other words, you're telling me they know when one of them is sick?"

"Certainly," Don said. "And us too. Human flesh has basically the same density as sea water. But the lungs, the bones, the blood vessels reflect sound pulses differently. In the water, we probably look like X-ray images of ourselves to porpoises."

"Yeah, but they still can't communicate abstract ideas."

"They can tell when someone is happy or upset, by changes in heart rate and respiration."

"Don, I repeat: they still can't fully communicate."

"Maybe they've evolved beyond that," Don said. "Their lives are pure play. They're happy. Can we say the same?"

Liz drummed her fingers on the tape recorder she held on her lap. Suddenly she felt uneasy about the creatures that played beyond the window. It was as though they had begun to pose some vague threat to her.

"No, I won't believe that," she said.

"Won't believe what?"

"I'm not about to believe that those porpoises out there are more advanced than we are. That's absurd. If they were really intelligent, they'd have built cities. They'd have a culture, a literature."

"Spoken like a New Yorker," Don laughed. "Liz, what would they need with cities?"

"Well, er—"

"They have no overcrowding, no smog, no poisonous air, no pollution, no unemployment, no murder. They're perfectly in tune with their environment. Cities for them would be a step down."

Liz said nothing.

"What the hell," Don said in a strangely different tone of voice. "What am I going on like this for? You may be right; it's all just words anyway. Hey, how about a game of Risk? I've programmed the computer for a three-player game."

"I don't think so, Don," she said. "I've got a lot of work to do."

"So do I, but that can wait. Come on. Just one game."

* * *

The three of them floated over a landscape that looked strangely alien with its ledges of coral and

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blossoms of anemone and star-fish. Liz had the sensation of flying as the humming engine of the mini-sub propelled them through the sea. Below them divers flippered over the excavation site, collecting more samples from the yawning trenches. A few porpoises swam around them as they worked, darting in and out of the silver bubbles that shimmered above their scuba tanks, as though the creatures wanted the bubbles to tickle their underbellies. One of them swam up to the sub, peered in the window for a moment and then darted off.

"They always look like they're smiling," Liz said. "Don't you think so?"

Eastlake steered the sub over the last trench and said nothing. Don sat in the third seat with his feet propped up on the dashboard, and watched the porpoise swim over to its companions.

"Professor," Liz said to break the uncomfortable silence between the two men, "in the two weeks that I've been here, I've seen and heard a lot of things that strain believability. I think I should tell you that, although I believe you, some of the other news services are already calling you a charlatan."

Eastlake shrugged.

"Professor," she continued, "I'd like to do as much as I can to make the importance of your discovery reach even the most skeptical of people. But, frankly, I can't do this if you don't tell me everything."

"What do you mean?" Eastlake said.

"I mean that you haven't been very honest with me," she said cooly.

Eastlake looked fiercely at Don.

"Carus, what have you told her?"

"Nothing," Don replied.

"So help me," the Professor threatened, "I don't care if we have to reprogram every operation in the Center; I'll have you fired for this!"

"Don didn't tell me anything," Liz said. "That was just a guess—a hunch I had. From the very beginning I've had the feeling that you two were keeping something from me. You've been fighting each other non-stop, Don's been making vague comments about your keeping things from the media—"

"Don's an irresponsible fool," Eastlake said, looking straight ahead. "He's just out to sensationalize the truth for the sake of causing an uproar. It's just another of his adolescent pranks."

"You always did feel insecure about having me around," Don said caustically. "What's the problem, Eastlake—the fact that my brain has the Von Aachen lobe and your doesn't? The fact that I'm further evolved?"

"All the evidence isn't in on that yet, Carus," the Professor snapped. "For all anyone knows for sure, that may just be brain damage."

"Bullshit."

"You're a clown, Carus. You're

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no better than one of those Do-Nothings on land. What's worse, you're down here among serious, dedicated people."

"Who will continue to screw up the planet because they are so god-damned serious and dedicated. Because they can't let well enough alone—"

"Gentlemen!" Liz exclaimed. "You can fight with each other after I leave. Right now, I need some answers. Professor, why did you call me down here if you didn't want me to learn the truth? Did you just want me to get a good picture of you for the papers?"

"Way to go, Liz."

"Quiet, Don."

"No," Eastlake said, "that's not true."

"Tell her, Eastlake," Don said calmly. "Tell her what really happened to that ancient race of man."

"Carus, so help me—"

"Go on, Professor. If you don't, I will. Humanity will adjust to the news. They're more resilient than you think. You never did give the average person credit for an ounce of intelligence."

"What news?" Liz demanded. "What became of them?"

"Those people," Don said, "didn't just die out all of a sudden. There was no plague, no sudden sinking of their continent. They changed. They evolved, naturally. Think of it, Liz: modern man developed from little fuzzy prosimians that looked like over-sized squirrels, in about thirty million years. These fully-developped human beings existed over sixty million years ago. If they still existed, chances are they'd look very different from what they once did. They'd have evolved."

"Then you're saying they're still here?" Liz asked.

"They're right out there," Don said. "See them—swimming beside the sub?"

"Porpoises?" Liz said breathlessly. "You mean—"

"Don is right," the Professor said, "For a long time it's been known that porpoises and whales evolved from some land mammal that for some reason took to the sea about fifty to sixty million years ago. Nobody was really sure what that mammal was until now."

"Liz," Don added, "we've found skeletal remains you haven't seen—remains that span many centuries and show the change from land to sea mammal."

"I knew it! I knew you weren't showing me all you found!"

"And that is the *real* story behind Jonah," Don said. "Haven't you ever wondered why their brains are so similar to ours?"

"When their continent sank," Liz said slowly, "they took to the water."

"Just as we are doing now," Don said, "for different reasons."

"That's what's so disturbing about our discovery," Eastlake said. "That's the big news we have for humanity."

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The sub broke the surface.

* * *

The yellow sky burst in on them through the foam. They bobbed for a while near the hexagonal dock as a cruiser approached them from land. It was travelling very fast.

"That would be my boat now," Liz said dazedly. "Look how funny the sky looks . . . it's so yellow . . ."

"Liz," Eastlake said earnestly, "the news that we weren't first on the planet will shock a lot of people. Prepare them for it."

"Professor," Liz said, "tell me one last thing: is this going to happen to us too?"

"Probably not. But then no one can know for sure."

"Liz," Don interrupted, "it won't be such a bad thing. Eastlake here just can't stand the idea of change. It's evolution; when we become like them, nature will have corrected itself, restored things to balance again."

Someone was yelling from the cruiser.

Don opened the hatch, and the three of them climbed out on the dock.

"Liz," the man said breathlessly, "quick. Get aboard. We've got to get to the airport before the shock wave hits."

"What?" she said blankly.

"War? We've been so busy, I—"

"Come on, quick. I'm sorry, you two, but I'm only authorized to take Miss Devlin."

"We can take care of ourselves," Don said. "Liz, I'll get your bags."

"Can it be?" Eastlake whispered. "After all this time. . . ."

"The sky," Liz said, looking up. "That's why it looks so strange."

"Liz, hurry," the man said. "A jet is waiting for us on the main island."

Don returned with her luggage and threw it over the side of the cruiser while Liz climbed the ladder from the dock.

"Don," Eastlake said, "we've got to get back down and help the others."

"Professor, Don," Liz called from the boat, "I want to come back. I want to know all you find out."

Don waved good-bye and nodded. It was the kind of nod he used to give Eastlake when he wasn't listening to a word the old man was saying.

The air was hot and humid.

Over the distant land a trail of black smoke smudged the sky.

The sun burned red above the horizon.

Liz watched the small sub disappear underwater. Near the ring of bubbles it left, a porpoise suddenly leaped playfully into the air and slapped its tail on the surface of the blood-warm sea. ★

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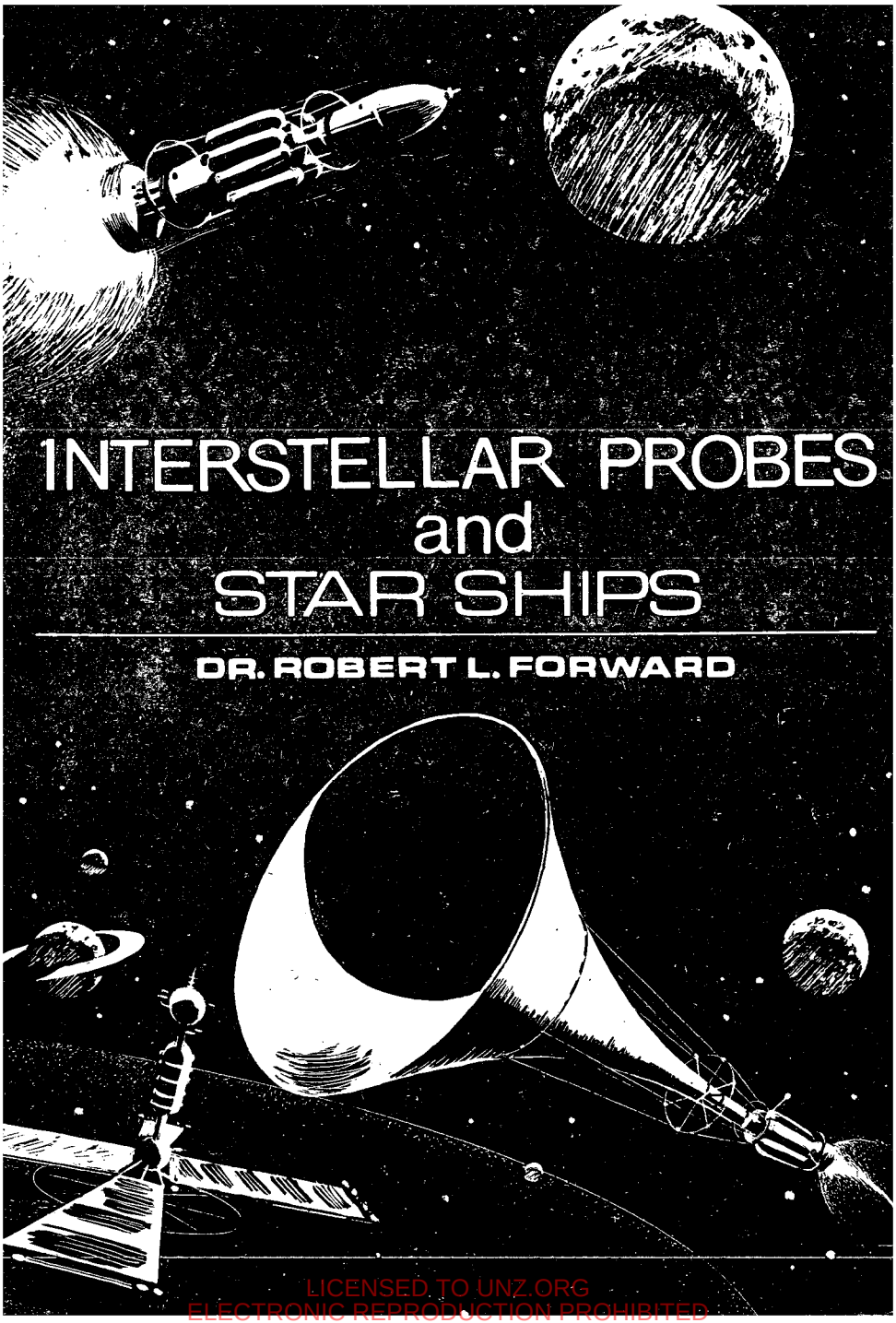

INTERSTELLAR PROBES and STAR SHIPS

DR. ROBERT L. FORWARD

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THE YEAR IS *1936. The world is just recovering from the Great Depression. New technological miracles are blossoming. The newspapers contain stories of telephone calls across the country, airplane flights across the Atlantic, and that new rich-man's toy, television. Newspaper stories of Dr. Goddard's historic first rocket flight of 10 years ago are almost forgotten . . .*

Suppose that in 1936—40 years ago—someone had proposed a program for interplanetary exploration. This preposterous program would have had an initial goal of sending an automated probe to the moon within 25 years, followed by the landing of a man on the moon within 50 years. This program would plan to use advanced aircraft-construction techniques to produce rockets as tall as buildings, containing hundreds of tons of liquid hydrogen and liquid oxygen as fuel—but only three passengers. These incredibly expensive vehicles would only be used—once!—the various parts being dropped into the ocean, or left in orbit, or left on the moon. To carry out this flight the power generated by the rocket engines during launch would have to exceed the total installed electrical generation capability of the U. S. in 1936 (20,000 MW). The program-cost over the 50-year period would exceed the Federal appropriations for 1936 ($8 B). Yet the proposer would have the audacity to say that all this was possible with only predictable 10-30 year projections of 1936 technology.

I doubt that anyone in 1936 would have supported such an idea. "A man on the Moon in 50 years!!—Impossible!!—That is nothing but ridiculous science fiction!!—We have more important things to spend our money on!! After all, the unemployment rate is 5%!"

But, as we all know, that was exactly the way it happened. It happened because it was technologically possible and politically needed, first by the Russians (to prove they were better than the Americans), then by the Americans (to prove—"No you aren't"). But it did not take 50 years for this science-fiction fantasy to become a reality; the first man stepped on the Moon on 20 July 1969, just 33 years from 1936.

It is now 1976. The newspapers contain stories about men exploring the moon, automated probes landing on Mars, spacecraft swinging by Jupiter with enough energy to go sailing off into interstellar space—never to return to the solar system.

It is time to start planning for Interstellar Exploration to turn today's science fiction into the realities of the future. Our developing capabilities in controlling fusion, beaming laser energy, tailoring new structural materials, and increasing the intelligence of computers while reducing their size, weight and cost, will make interstellar exploration of

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the nearby stars technologically feasible. All that will be required to focus this technology on interstellar exploration will be the political need, and that political need will come.

For the same political reasons that they launched SPUTNIK, the Russians have already launched their version of the SETI program to search for messages from interstellar cultures. One day—not too long from now—they will launch their first interstellar probe. Will we be ready?—or will we again have to be asked by the politicians to start a crash project to catch up?

FEASIBILITY OF INTERSTELLAR EXPLORATION

Going to the stars is not easy—but it is not impossible either. To travel to the stars will take years of time, gigawatts of power, kilograms of energy, and billions (if not trillions) of dollars. Yet it can be done—if we wish to.

We don't have to wait centuries for the development of some exotic new propulsion concept like antigravity or space warps so we can go hopping around the Galaxy. There is a lot we can do here and now with reasonable extrapolations of our present day technology that will suffice for centuries of interstellar exploration. Within 20 light years of the sun there are 59 stellar systems containing 81 visible stars and an estimated 500 planets. To explore these nearby planets we do not need to insist on 10 year round-trip times to accomodate fragile man; one-way trip times of 20 to 50 years using semi-intelligent probes will do. We do not need propulsion systems that accelerate to the speed of light; maximum velocities of a few tenths of the speed of light will do. We do not need the 100% mass conversion of matter-antimatter gamma ray photon engines; the 0.4% mass conversion of fusion will do.

Now, there are people who might admit the physical feasibility of interstellar exploration of the nearer stars, but who question the desirability of such a program when we can gain information about other interstellar civilizations more cheaply and more rapidly by listening with the special search arrays and signal processing equipment that are planned for the SETI program. I agree, that if there is someone at the other end who is sending information, then SETI will make a significant contribution to our knowledge. However, there may be many civilizations on those 500 planets near us that we cannot learn about by means of SETI. Some obvious examples are: civilizations on water-covered planets that never developed a metals technology; intelligent beings floating in the atmospheres of Jupiter-like planets; ancient cultures that are now extinct, but which left rich treasures for an

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astro-archaeologist; besides which there must be other non-radio cultures that we cannot even begin to imagine now.

In my view, interstellar exploration with automated probes is complementary to the SETI program, rather than competitive with it.

INTERSTELLAR PROBE DESIGN

The design of the probe is the critical element in any program for interstellar exploration. The rigors and length of a journey involving high accelerations with high energy density engines, the years of bombardment against interstellar matter at high relative velocities, and the decades of operation with no means for repair, or even diagnostic help from earth, means that a new level of self-diagnostic, self-repairing, multiply-redundant probe design must be developed.

Ultimately, the computer in the probe will have to exhibit semi-intelligent behavior when presented with new and unforseen circumstances.

The requirement for multiple planetary exploration at each stellar system will limit the number and weight of lander probes available, and puts a premium on long-range sensor capabilities to gather the same data from orbit. These, in turn, require very high resolution capability from orbital altitudes, which drives up the size of the transmitting and collecting apertures desired.

Yet despite these needs for performance the energy requirements for achieving flight velocities approaching that of light are so large that the weight of the probe should be kept to a minimum. Development efforts on multiple frequency transmitters, antennas, sensors and data processors are needed to minimize the payload.

What we desire in an interstellar probe is a large physical size (to give the transmitting and receiving apertures desired), and high power (for active sounders and data transmission), all combined with light weight.

I would like to see the designers get a goal of 100 kg for the weight of an interstellar probe. The design of such a probe is a challenge—but an important one; for the weight of the probe determines the sizes of the propulsion system.

INTERSTELLAR PROPULSION CONCEPTS

There are not one, but many possible techniques for interstellar propulsion that have received enough study so that we know that they have the basic energy and power capacity to be considered for interstellar propulsion. All of them still retain a number of technical uncertainties and will require significant engineering effort before they

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can be said to be engineeringly feasible. Here are four of them.

1. Nuclear Pulse Propulsion. This is the old Orion concept. The propulsion system operates by jettisoning a small nuclear bomb out the back, exploding it, and absorbing part of the momentum of the resulting plasma cloud on an ablation plate mounted on shock absorbers. A study of a design for an interstellar version was carried out by Freeman Dyson. It had a very large payload, 45,000 tons (enough for a small human community) and a supply of 300,000 bombs that weighed six times the payload. The bombs are exploded once per second, resulting in a one-g acceleration for 10 days, or a final velocity of three percent of the velocity of light. This velocity would get the ship to Alpha Centauri in 130 years. The Dyson design is marginal for interstellar exploration, but has the important feature that it uses proven technology. The recent British Interplanetary Society Project Daedalus study designed a newer and higher-speed version of an interstellar nuclear-pulse jet that used micropellets of fusionable material ignited 250 times per second by lasers or relativistic electron beams.

2. Controlled Fusion Rocket. We are at present not certain which of the many proposed techniques for controlled nuclear fusion will prove feasible, but whatever method results, it will be a prime candidate for the propulsion portion of an interstellar exploration mission. Most of the present effort in fusion research is concentrated on the development of leakproof magnetic bottles. Fortunately, for the propulsion application, what is desired is a *leaky* magnetic bottle, the leak of hot plasma being the reaction jet. However, because of the low 0.4% energy conversion efficiency of the fusion reaction, interstellar exploration with fusion rockets will require massive vehicles with large mass ratios.

3. Interstellar Ramjet. No matter how good one can make the Orion or Fusion rocket concepts, they are still forced to carry their fuel along with them. The interstellar ramjet instead uses a large magnetic scoop to collect interstellar hydrogen to fuel its fusion rockets, thus eliminating the need to carry fuel. Studies have shown that the ramjet takeover velocity is extremely low, so that conventional rockets could provide the initial acceleration. A large vehicle with a frontal intake radius of 300 km could achieve a one-g acceleration through interstellar space with a nucleon density of 1 to 1000 nucleons/cc. There have been many studies of this concept, including a recent one that recommended carrying along a carbon catalyst to overcome the low cross section of the proton-proton reaction.

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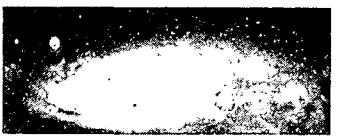
4. Beamed-Power Laser Propulsion. Although the Ramjet does not have to carry its fuel, it does have to carry and maintain an engine. The beamed-power laser system does not have to carry either fuel or an engine. The spacecraft would be in the form of a large solar sail, many kilometers across. A large laser on the earth or in orbit around the sun would send a beam of laser light to push the spacecraft. For many years, this concept did not receive much attention, for it was thought to be limited to flyby missions, since there would be no laser at the target star to decelerate the spacecraft. However, if after the spacecraft is up to speed it lets out a long wire to increase its self-capacitance and then uses radioactive materials to develop and maintain a charge, it will interact with the interstellar magnetic field through the Lorentz force and will swing around in a large circle. If the mission is planned correctly, the spacecraft will arc around behind the target star and be coming by the star with its velocity vector pointing at earth. We then turn on the laser again and decelerate the spacecraft at the target star. To carry out a rendezvous mission with the beamed power laser system would require a laser array 250 km across, so that the laser beam will not diverge significantly at the 6-to-10 lightyear distance required to decelerate the probe. Although the laser array must be large in area, the array does not need to be filled with lasers and the energy flux from the laser array is not high; in typical system designs the laser beam is no more powerful than sunlight.



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There are other, newer concepts that have not received as much study, but which look very promising. One uses beamed laser energy from earth to energize reaction mass carried on the ship. The other uses a small amount of anti-matter (about 2%) to energize a much larger amount of regular matter.

Arthur Clarke (one of the earliest members of the British Interplanetary Society) said in his book *The Promise of Space*:

"With so many theoretical possibilities for interstellar flight, we can be sure that at least one will be realized in practice. Remember the history of the atomic bomb; there were three different ways in which it could be made, and no one knew which was best. So they were all tried—and they all worked."

JOURNEY WITH AN INTERSTELLAR PROBE

In 1998, an interstellar probe, which has been waiting in space in the region beyond the moon, launches itself toward the triple star system Alpha Centauri. It thrusts at high acceleration, its engines running at a power level that is ten times the power of a Saturn V rocket. The exhaust of hot hydrogen plasma glows like a bright star, visible both night and day.

After four months the probe has left the solar system, and has reached 1/3 the velocity of light. It begins its long drift through interstellar space using its bulky first stage shell as a radiation barrier to protect it from the constant rain of high energy particles produced by its high speed through the interstellar hydrogen. After drifting for 12 years (it has now covered four light years), it sheds its first stage, turns around, and begins deceleration.

As the probe velocity drops well below relativistic speeds and it approaches its target, the spacecraft opens up its compact one hundred kilogram mass into a sphere one hundred meters in diameter. The sphere is a dense wire mesh embedded with arrays of tiny sensors and transmitters, close-coupled to complex molecular-sized digital circuitry, all held together and interconnected with high strength, one-dimensional superconductive fibers.

The probe turns its attention back to earth to receive its latest instructions. A pulsating laser beam, bright through the background glare of the now distant sun brings a message from its masters on earth. Large new telescopes on the moon have detected a planet within the life-supporting zone of the small red dwarf star, Proxima Centauri: "Go and investigate!" The command is over four year old, but it is the most current that the probe can expect.

The array of sensors spaced over the sphere collect the light and radi-

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ation from the three stars in the Alpha Centauri system and correct the rocket thrust to zero in on Proxima Centauri. As it approaches the small red star, the probe searches for the planet. It is there, along with three others farther out. They are cold, and probably lifeless, but they too will be visited before the probe leaves Proxima Centauri to investigate the other two stars in the Alpha Centauri system.

With its thruster at low power, the probe approaches the planet, constantly beaming pictures and sensor data back to earth, using a phased array of solid-state lasers scattered densely over its surface. Earth will not see the pictures of the new planet for four years, long after the probe has completed its survey and moved on to the other planets and stars in the Alpha Centauri system. With no feedback possible from earth, the molecular-sized computer circuits distributed throughout the mesh in the sphere analyze for themselves the information its sensors collect as it approaches the planet, and the probe swings into a near polar orbit and begins a survey.

Wideband sensors sensitive to the entire electromagnetic spectrum produce imagery in the radio, microwave, infrared, visible, and ultraviolet bands. The one-hundred-meter size of the detector array gives the pictures a resolution of less than one meter even from the 1000 kilometer orbital altitude. Picosecond pulses of laser light beam down as a laser radar to measure the height variations of the topography. Certain regions that might have life are interrogated with selected laser wavelengths, and their return light analyzed to look for absorption or fluorescent bands characteristic of organic compounds.

A few regions that have the most potential for life are selected. Small portions of the sensor mesh on the sphere detach from the main probe mesh and are driven down into the atmosphere with radiation pressure from the lasers on the probe. The small sections of mesh drift down to the surface, collecting and storing images as they descend. The mesh settles on the surface where specialized chemically sensitive molecular circuits react to the various forms of chemical compounds found there. The orbiting probe interrogates the lander mesh with a laser beam, collects the images and chemical data the lander has stored, combines it with the other information that it has collected and sends a detailed report back to earth.

The probe then moves on to the next planet in the system, more slowly now, for it is no longer as lavishly supplied with fuel as it was at the start of its mission. It will not stop until it has made a complete survey of every planet in the three star system. This will take a long time, but the probe has a lot of time. It will be at least 30 years before man will arrive to take over. ☆

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GORDON EKLUND

THE TIDES OF TIME

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If saving Abe Lincoln was beyond him, how then could he save the world?

On April 14, 1865, James Watson crouched in the back shadows of Ford's Theater in Washington City and waited with as much patience as he could muster for John Wilkes Booth to come skulking past. When that happened, Watson intended to dart quickly from hiding and rap Wilkes on the skull, thus managing once again to preserve briefly the life of President Abraham Lincoln. Watson wasn't excited or nervous. He'd done this at least a hundred times before.

But, before Watson could actually move, he happened to glance down at his feet and noticed a sheet of folded white paper lying on the floor. It wasn't the paper itself that attracted his attention, but the fact that he suddenly recognized his own name neatly printed upon the exposed surface of the sheet.

He unfolded the paper and, straining against the surrounding darkness, read:

> Jim: I've got to see you right away. Remember the Log House? I'm there now and very ill so please come immediately. I'm convinced I've found a way to change everything.
>
> Rebecca Kingsley

The broad expansive signature made Watson wince briefly. Rebecca Kingsley, the most famous actress of her age, but lately, like himself, an exiled timerider. What could she possibly want with him? He hadn't seen her since shortly after the blast, when they had jointly created a wonderful, magical nineteenth-century Ireland, where Rebecca had reigned as a sort of queen of the stage. But that had been a transient phenomenon and after the tides of time rose to sweep their creation away Rebecca had left him without even a good-by. He had heard occasional rumors of her whereabouts from some of the other riders, who placed her variously in medieval England, twentieth-century Japan, and Bernhardt's Paris. He had thought Garbo's Hollywood a more likely location.

And now she wanted to see him again. Demanded to see him again.

He did remember the Log House. It was the place to which she had brought him when they'd first gotten together. A modest cabin in the Colorado foothills of 4004 B.C. She never had told him who'd built it for her, but from the joke of the date, he'd guessed William Stye.

Soft, scraping footsteps sounded from below. Hastily, Watson tucked the message inside a pocket of his frock coat. Booth? Yes, undoubtedly—but should he bother to wait? Rebecca Kingsley had beckoned and, no matter how much youthful pain she had once caused

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him, he knew he could not hesitate to go.

His mind made up, Watson leaned more intimately into the shadows behind. As the footsteps drew closer, he shut his eyes and pictured the Log House as he remembered it. A rising green country dappled with early spring snow. A puff of dark smoke streaming from the stone chimney.

At first, he experienced no sensation of motion but when he opened his eyes the gray, indistinct, spiraling blur of the timestream stretched endlessly in front of him. He shut his eyes again and waited patiently.

When he opened his eyes once again, feeling a chill wind upon his face, he stood only a few yards in front of the Log House. It differed only slightly from the vision he had pictured. The logs were more worn, and the moss grew more thickly.

At the doorstep, he paused a brief moment. What should he say when he saw her first? The words failed to come. Perhaps there were none. The whole thing had undoubtedly happened a long time ago, though he had no way of knowing that for sure.

Stepping forward, Watson called out, "Rebecca, I'm here. It's James."

* * *

He found Rebecca Kingsley in the second back bedroom. She lay in a wide bed covered with thick blankets and a quilt. At first, he barely recognized her: the sunken, pale face of an old woman, the whisps of gray hair, the swollen lips and parched gums. Could this be the same woman who had once set the hearts of a billion men on fire?

When she spoke, he knew it was she. The voice had hardly changed at all. "James, I knew I could trust you."

"Yes, I came." Hestantly, he crossed the room. The floor, what little of it could be seen, was badly warped and cracked; the rest was piled high with a puzzling array of books, maps, charts and papers.

He stood over her bed and struggled not to show the emotion he felt. "It's been a long time."

She laughed. "You mean I've grown old."

"You—you're sick." He saw no reason to be unkind—not now.

"I'm dying. But I'm dying because I'm old. I was fifty-three when the blast did this to me. I could be eighty by now. Who knows?"

He shook his head, trying to make sense of what she had said. Fifty-three? *Then?* This woman he had once loved? "You said in your note that you wanted to see me for a reason." Instinctively, he had drawn away from her in—what?—shock?—disgust?—revulsion?

She pointed with a bony hand. "Look under my bed. Find what's there and look at it."

He bent down obediently. His

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fingers moved tentatively through the thickly piled dust until they closed around something round, heavy and slick. He withdrew his hand; in it he found a roll of paper. "What's this?" he asked, sitting back on his heels.

"Open it and see. It's what I've been doing all these years—since Ireland fell apart."

Tucking one end underneath a heavy book—*The Age of Faith*—he drew the roll of paper across the floor, pushing aside the scattered piles of other books and papers. "You mean, all that time, you were just here."

"Yes."

It was one place he would have never thought to look. "Some of the others said they'd seen you."

"People always think they're seeing me."

The roll of paper lay open upon the floor. He looked. It seemed to be some sort of historical chart. Dates ranging from 4500 B.C. through 1996 A.D. were printed across its top, while underneath were various notations. He read one that concerned him particularly: 1865—Lincoln not assassinated; Lee appointed to cabinet; freemen suffrage voted down. "What's this for?" he finally asked.

"Can't you guess?"

"You want to change history."

"Exactly." She was smiling again.

"But don't you know by now that it can't be done? I would have thought Ireland would have showed you that. It can only be temporary. The tides of time always come sweeping back."

She seemed unmoved, a cold, brittle statue. "This chart lists six hundred separate historical incidents. All you've ever done before has been piecemeal. History is more like an avalanche. That was our mistake. One tiny pebble high on the mountain begins to fall, and that pebble strikes a bigger rock, which also falls, striking another and another and another. If you reach in and remove a rock from the middle of the mountain, then the slide will continue. I intend to remove the first pebble before it can begin to fall."

"But another pebble—one beside it—may come loose and start the slide anyway."

"I intend to remove all the pebbles. Six hundred pebbles, rocks, and boulders. I can change history, James. When I'm done—when we're done—then the blast will not occur."

He nodded. "I thought you might have that in mind."

Her voice assumed a newer, deeper tone. "It ruined all our lives, didn't it? You know what I was before it happened, who I was. All of that beauty ended, and for what reason? Because a half-dozen politicians suddenly went mad and decided to blow up the world."

"We were lucky. Five billion people died."

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"Do you call this better?"

He had no answer to that. She lived in a different world. "What do you want me to do? Help you cause these changes?"

"Me?" She laughed bitterly. "Damn it, can't you see that I'm dying? What can I do? No, we'll need the others. All of them. Only by working together can we succeed before it's too late."

He knew what she meant: too late for her. "I can ask them to help."

"No, you'll bring them here. All—what is it?—"

"Twenty-seven."

"All twenty-seven of them. Five minutes after you leave, bring them. You know where to find them."

"I think so."

"Good." She smiled with sudden serenity. "And it'll work, James. I know it will."

He was staring at the chart. Was she right? He saw the rise of Egypt, the birth of Christ, the empire of T'ang, the visions of Leonardo, and the wars of Napoleon and Hitler. All of human history reduced to six hundred critical moments. Could all of time be so distorted, twisted into such an unrecognizable form, that like a child's plastic doll it would fail ever to regain its original shape?

Rebecca obviously thought so.

And, if she was correct, then the end of the world need never have happened.

* * *

What James Watson called the end of the world was also known as the blast. The year was 1997, but Watson himself, then only twenty-two, a minor accountant in a West Coast bank, remembered almost nothing of it. Only much later had he and the other timeriders been able to piece together what must have occurred that day.

It was final, total, terrible nuclear war. Whisperings of such an event had long been heard on the wind, but no one—except perhaps the half-dozen men possessing the power to make it happen—had ever actually believed that such a disaster would come to be.

But it had. Watson could remember sitting quietly in the office that day, studying a pile of computerized accounts, when an enormous flash of light through the window had struck him suddenly blind.

And then he had been falling. An endless, vague, indistinct, gray spiral swept around him. Hours might have passed—even days.

And then a stray thought had come to him. He later understood that the thought had originated in a book he had been reading the previous night. A history book. A history of the American Civil War.

And, as he fell, he happened to think of the great battle fought at Gettysburg.

A split second later, he was there. At Gettysburg. On the battlefield. Overhead, rockets flared and cannonballs burst.

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That was the beginning.

It took time—whether days, weeks, or months he could only guess—to understand, comprehend, develop, and accept his new talent. Eventually, he realized what he possessed was the freedom to roam at will the entirety of the known past. Simply by thinking of a singular moment in time and space and then picturing that moment firmly and completely in his mind, he could travel there.

The blast, whatever its effect on the rest of humanity, had somehow set him free from sequential time.

There were limitations also. If he didn't know enough of a particular time to picture it realistically, he could not travel there. Nor could the same body ever occupy more than once the same point in time. What this meant was that any time subsequent to June 18, 1975—the date of his own birth—was permanently closed to him.

It wasn't until Rebecca Kingsley found him that he realized he was not alone. He was eating dinner in a plush restaurant in New York in 1836 when an astonishingly familiar woman had suddenly sat down across the table from him. She said, "You're the one, aren't you?"

Unable at first to believe his own eyes, he replied, "No. No, I don't think so."

"You know who I am, don't you?" Her composure was perfect. They could have been discussing next week's weather.

"You're Rebecca Kingsley," he blurted out.

"And you're from 1997, blown here by the blast."

"The what?"

"The big war. That's what I call it—the blast." Because of what it's done to all our lives. Blasted them completely to ruins."

He and Rebecca Kingsley spent that evening together in his hotel room—lifting a considerable number of eyebrows in the process—fulfulling, at least partially, an old fantasy of his.

She had explained how she had found him through a simple process of elimination. "When you're in time and not supposed to be there, you're going to do things that wouldn't otherwise be done. You're going to cause little waves to ripple on the pool of history. Say, for instance, tonight when you were eating at that nice restaurant. Suppose, normally, instead of you, another man was sitting there. Suppose a woman happened to pass the table and caught his eye. Suppose they talked, became friends, lovers, and later married. Suppose they had twelve children, each of whom had seven of his or her own. In that case, because of you being here tonight, a hundred years from now several hundred people will no longer exist. Now further suppose that I'm another time traveler operating in 1936. When all sorts of people around me start winking out of existence, most other people

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won't notice—but I will. A little bit of research—who's winking out and why—and it's not too difficult to trace down the trouble center. That's how we've found each other so far."

"You mean there are more than just you and me?"

"Nineteen others so far. All from 1997. All tossed here by the blast."

"I—I'd like to meet them."

"Oh, you will. But they're ordinary people. Not like me. You won't have heard of them."

It was then that she had gone on to explain to him how, working together, they could create from the raw material of Irish history a place that would be like paradise for both of them.

And of course he had agreed to go with her.

In the end, a total of twenty-nine timeriders had been discovered. As for the others—a world population in 1997 approaching five billion—they had no way of finding out anything about them: even if the world hadn't ended with the blast, they would probably never know what happened afterwards.

But now Rebecca Kingsley claimed that, whether the world was dead or not, she could resurrect it. The tides of time, which heretofor had permitted only brief, transitory change, could be fought, battled, subdued, and conquered.

Yet Watson wondered. The blast had created them—made them timeriders—given them this non-sequential universe in which to roam.

Could they now rise up and willingly strike down their own maker?

* * *

From choice—and uncertainty—Watson emerged from the timestream several hundred yards from his intended destination. He stood upon the familiar soft shore of a shallow forest pool, inhaling the thick scent of surrounding Georgia pine and battled to realign his senses in terms of this new place.

A loud splashing sound slapped the still air and Watson glanced up to see a flash of dazzling whiteness sliding underneath the dark waters of the pool. He recognized the girl at once. "Gina," he cried, when her head broke the surface.

"Oh, James." She waved and swam toward him. Gina was younger than Watson—she'd been in college at the time of the blast—but they had once spent a fair amount of time together.

When she emerged from the pool, she embraced him with her wet arms. "Well, I was afraid we'd lost you for good."

In the joy of seeing her again, he dismissed all thought of Rebecca and her plan. "I've been busy."

"Still saving Abe Lincoln?"

He shrugged. "It's an obsession."

"You're too serious."

"I know."

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As they moved through the forest toward the main house Watson considered telling her what he had to say, but decided to wait until later when everyone was together. According to Gina, ten other riders were presently staying in the house ahead. It was called Newport—in honor of a once famous resort—and took up a totally inconspicuous plot of land in central Georgia somewhere around the year 10,000 B.C. Some time ago (he could, of course, be no more specific than that), shortly after the end of his relationship with Rebecca, a group of them had joined to build the house as a sort of rest-home for weary riders. A few people stayed at Newport on an almost permanent basis, but most, like Watson himself, and Gina, appeared only occasionally. All of them made it a point to maintain sequential time as near as possible when visiting the colony. Such a policy avoided unnecessary confusion and kept the tides of time from rushing in.

Gina was telling him about a recent cross-country journey she had undertaken on a wagon train in 1846. "We were even attacked by Indians," she said. "Not a whole tribe, thank God, just a few marauders. But the whole thing was such an interesting experience—and so much fun. You ought to try it, James. Get out of New York and see the rest of the country."

"I've been to Boston. Even San Francisco—after the gold rush."

"And you ought to leave poor Lincoln alone, too." She seemed full of suggestions today. "I can always tell when you've been around, when people start talking about Ape Lincoln instead of the Great Martyr."

"I don't do it as a favor to his reputation."

"Then why do you do it?"

"Just to prove that I can, I guess."

"But the tides always obliterate it."

"And that's why I have to keep doing it. Over and over again."

Inside the big house—with its thick carpets, beautiful paintings, graceful sculpture and plush decor borrowed randomly from all of history—Watson leaned in the doorway of the downstairs parlor, while Gina excused herself to wander upstairs and dress.

Once his eyes adjusted to the curtained darkness beyond, Watson counted four familiar figures clustered near the smoldering embers of the fireplace. William Stye was a huge, round man, a former grocery clerk who now spent most of his time in Elizabethan England. Stye was presently talking, describing a rather tenuous relationship between Shakespeare and the Queen. Listening were Thomas Kittering, an unsuccessful artist who now lived in renaissance Venice, Hoy Ling, a Chinese farmer who divided his time between his country's numerous golden ages, and Thelma Nor-

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ton, formerly a waitress and now a sort of eternal prostitute. Thelma said the best way to get to know the real substance of any particular time was to catch the denizens at their most informal. She currently wore the high, gaudy fashions of the late 1920's.

Looking in this way, hearing Stye talk and seeing the others, Watson realized how very much he liked these people. He felt glad to be home again.

Stye was the one who noticed him standing in the doorway. "Hey, Jim, it's been a long while. Come in and get warm."

Watson went into the room. "I didn't know it was cold."

"It isn't, but you've got to admit that the fire is nice."

He nodded to each of the other three. Thelma rose daintily and pecked his cheek. The dwindling fire painted crazy, distorted shadows along the wall. Everyone seemed to stand twice as high as he should.

"I've been to see Rebecca Kingsley," he said.

"Oh."

Thelma finally asked, "How is she?"

"Not well. In fact . . . well, I think she's dying."

He hated to be the one who spoiled the atmosphere.

Gina entered the room from behind him. "We'd all thought she'd died long ago," she said, without a trace of gloom.

He turned thankfully to face her. "No, she's been hiding out in Colorado. In a cabin she has. 4004 B.C."

"I remember the place," Stye said.

"You'd think," Gina said, "a person like her couldn't stand so much quiet. Think of all that applause she was used to. There's nobody there now but some Indians."

"She's been working," Watson said. "Studying, I guess you could call it. And she's found something out—something she thinks is important."

"Well, what?" said Stye.

"I'd rather everyone were here at once before I told you."

"It can't be that important," Thomas Kittering said.

"I think it may be," said Watson.

Gina was looking at him intently, with something approaching suspicion. "Did Rebecca send you here with instructions to reveal this secret of hers?"

He saw no reason to be less than truthful. "She did."

But Stye was already on his feet. Bustling toward the door, he paused and told Watson, "I'll see who I can round up. Later we'll all talk. You haven't been around here in years, Jim."

Watson shook his head. "I wouldn't say that." For a timerider, no such thing as a year existed; there was only time itself.

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* * *

Once he had told them everything, Watson leaned close to the fire and waited for a response.

No one said a word.

When he could bear their silence, no longer Watson said, "Well? Come on. Somebody must have something to say."

"It won't work," William Stye said decisively. "There may be some degree of sense to it, but I just don't think so. At one time or another I imagine everyone here has tried to alter history, rearrange past events. I know I once married Shakespeare to the Queen. But it never lasts—it can't be permanent—so why bother?"

"Rebecca thinks her way will work. And, if she's right, then five billion people will be alive."

"But won't they all die anyway?" said a rider named Charles Francis, whom Watson didn't know particularly well. Before the blast, Francis had labored as some sort of dim civil servant; he now wore the garb of a Roman centurion.

"Yes," said Watson, "but there are descendants to consider."

"Why?" Gina asked sharply. "Why should we be the ones to consider them? We didn't blow up the world. Why should we have to save it?"

"I don't think anybody has said that we have to do this."

"Still," said Thelma Norton,

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who had changed into a less revealing costume, "it's quite an honor if you think about it. How many other whores have ever saved the world?"

"Then you think we ought to do it?" Knowing their answer in advance, Watson was eager to get this finished.

"We can't very well say no," Thelma said.

"Why can't we?" asked Charles Francis.

"Because," said William Stye, "it's not going to work anyway."

"But how can you be sure of that?" Gina asked.

Watson felt he ought to say something now. He faced Gina. "It's never worked before so we've always assumed history to be an inexorable process, something firm and definte. Take me, for instance. I'm always saving Abraham Lincoln's life. Do you know why? Because, no matter how often I do it, nothing ever really changes. With Lincoln alive or Lincoln dead, the world goes on pretty much the same. If you took a man from one version of 1866 and put him down in another—the one where Lincoln lived—he wouldn't know anything had happened unless he glanced at a newspaper."

"But you said Rebecca had found six hundred things to change," someone said.

"That's correct."

"Six hundred things in six thousand years of history," William Stye said skeptically.

It was Thelma Norton who voiced what everyone else was thinking. "But suppose it does work. Suppose we do away with the blast and do it permanently. What happens then?"

"One thing," Gina said, "is that Rebecca gets to be a big star again."

"And she won't have to die," Watson said, more kindly.

"But what about us?" asked Charles Francis. "Will we just—just go back?"

Watson nodded. "I imagine so. The blast created us. Without it, we'll just go on with our old lives as if nothing had happened."

"Because nothing will have happened," Gina said.

Watson nodded. "Except that five billion people—and a whole world—will be alive."

"I still say it won't work," said William Stye.

* * *

While those timeriders who had not been present at Newport were being tracked down within the timestream, Watson remained in the big house, resting, talking, swimming, and sleeping. A dim, mournful mood seemed to grip the place. Those riders not out in the stream kept close to their rooms or else huddled in the parlor close to the fire. Watson and Gina went walking in the woods. When they reached

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the pool where Watson had first arrived, Gina said she was tired and wanted to stop.

They lay side by side upon the wet grass and stared at the flat, smooth surface of the water. Watson discovered that when he glanced at Gina in this bright light he could clearly discern the first signs of aging in the skin around her eyes. He suddenly understood how much time must have passed since the blast first sent them here: Gina was old, Rebecca was dying, and he himself felt very, very tired.

"Well, what do you think?" she said at last. "I don't suppose there's anything to be gained by pretending it's not happening."

"No." He knew what she meant. "But I can't tell you. I saw the chart, but that's all. Maybe it'll work and maybe it won't."

She nodded thoughtfully. "Do you want it to?"

He shrugged. "Why? Don't you?"

She shook her head. "I'm just not sure. There's her, for one thing. I don't want her to die but . . . well, does it seem fair to you? Rebecca was someone important in that other world, but the rest of us—we were nothing. William ran a grocery, you were a bookkeeper, and I was still attending school. James, I think I'm too old to go back to college."

"You'll never even know you were gone," he said.

"I know and that's the most frightening thing of all. It's almost like killing yourself. All these years lost and gone. I won't remember the wagon train—not any of it."

"We'll all lose a lot."

"No, we won't." She rose on an elbow, stiff with anger. "She won't—Rebecca won't—because she doesn't have anything to lose. I was so excited when she first found me. She was something I knew, someone famous, and I had been completely lost until then. But she never cared. She never saw the possibilities. She hated the past. She still does. She hates it because here she's nothing."

"I'm not sure that's entirely fair."

"It's still twenty-eight of us against one of her."

"No," he said. "It's twenty-eight of us against five billion of them."

She sighed and dropped back down. "I know. And that's why we have to do it."

* * *

At last the moment came when all twenty-eight timeriders had been found and brought to the big house and informed of Rebecca's plan. Together they fell into the waves of time, propelled by Watson's description of the cabin in the woods, and in time they emerged in the Colorado Rockies of 4004 B.C., only minutes after Watson's last departure.

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He led the way into the rear bedroom where Rebecca lay waiting. Even in such a short period of time, she had visibly deteriorated. As the riders crowded around her bed, all of them showing their obvious discomfort at the nearness of death, she struggled to sit up to greet them. Finally, Watson adjusted her pillow so that she could use it as a backrest. "Well, so you decided to come, after all," she said in hardly more than a whisper. Her eyes shifted slowly from face to face, pausing only briefly at each. "William Stye, Georgia Kane, Charles Francis—I know you all so well."

"It's been a long time, Rebecca," said Stye, speaking for all of them.

"But you don't know how long, do you?" She laughed hoarsely. "That's the problem, isn't it? We never know how much time we have."

Watson shifted uncertainly at the head of the bed. "I've told them everything you told me, Rebecca, and everyone is agreed. We're ready to begin now."

"Ready to begin to give me my world back?" she said bitterly.

"No, to save the lives of five billion people," Gina said.

Rebecca appeared not to recognize her. "And yourselves."

"No, not us, Rebecca—just you."

Watson could see no gain in such bickering. "Perhaps we ought to get started," he suggested.

"An excellent idea, James." Rebecca smiled thinly. "Considering my condition, the sooner, the better." She pointed one brittle finger. "The chart is there on the floor where you left it. I'm afraid I'll have to ask you to take charge. Begin at the beginning. The first incident you find—it's Sumerian writing, I believe—and then follow through. I recommend each of you try to return within moments of your last departure. There are only twenty-eight of you and six hundred incidents to cover. This will take, if you'll excuse the term, time, and I'm not sure if I have that much left to me. Perhaps if I do die first, it won't make any difference—I will still live then. But some things must be permanent—and death may well be one of them."

William Stye stepped forward and volunteered to go first. "I've been to Sumeria before."

Gina said she would be second.

The others formed a line in front of the chart.

Watson read the historical incidents one after another and made certain each rider was straight in his mind about the date.

As they moved, no one spoke. One after another they winked out of existence.

After Charles Francis had left for Stonehenge and 1700 B.C., Watson was alone with Rebecca once more.

She smiled at him and her voice took on a new strength. "It will work," she said.

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"Are you sure you want—?" But he stopped. William Stye materialized in the center of the room.

* * *

Once the operation was moving efficiently Watson grew tired of waiting and decided to join the others in the timestream. When he returned from 1066 and the Battle of Hastings he found himself alone with Rebecca. Even though no more than three hours could possibly have passed since their first arrival, she seemed noticeably drained. He watched her lips moving silently and suddenly understood she was trying to call him.

He left the chart and went over to kneel beside the bed. "Yes, Rebecca."

"James," she said, as if uncertain of his real identity.

"Yes."

"You don't understand this, do you?"

"No. No, but I think you do."

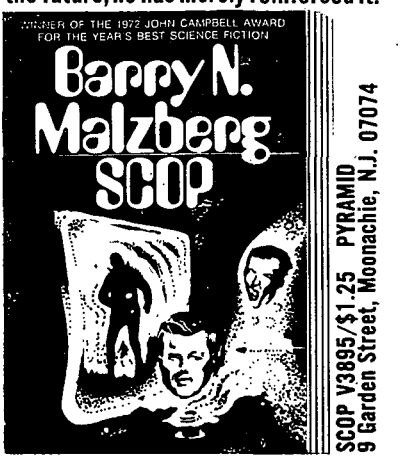
"It's because of Ireland."

He hadn't expected that. "It is?"

"Yes. Do you remember what we did there?"

"I remember that we altered history so as to drive the English out during Elizabeth's reign. And then we broke with Rome and established a liberal Catholic church and revived all the old myths and legends and created a country where the arts would blossom."

It is the 21st century, but Scop is in 1963—attending assassinations. He's warned, cajoled, pleaded . . . but he knows he's a failure. Trying to alter the future, he has merely reinforced it!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"And then we became stars," she said.

"Well, you did."

She nodded. "But that was what hurt—what made it seem no good. It wasn't real, James—it never was—and I always knew it. You see, we could have done it again. Not necessarily in Ireland but somewhere else. It was a lot of work, and it didn't last long, but we could have started over."

"Yes, I suppose so. I just never thought. When you went away, that seemed to end it."

"But don't you know why?"

"I thought I did. I thought you

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were angry because of the tides. When that world was washed away, everything seemed suddenly senseless."

"No, James, that's close but not it. The senselessness began before, when the world we created was still firm. It was senseless because we had made it that way. We were successful and famous—I was—and we had everything, but there was no pleasure in it. Do you see what I'm saying? Why try to win when there's nothing to struggle, against?"

"Yes, I see."

She shook her head. "No, you don't. You can't. You're not me, James, and none of the others are, either. Of course you resent me. But try to remember that nothing I achieved came easily and, when I could have had it that way, in Ireland, I refused."

"Is this easy?" He indicated the chart.

"There's no pleasure in it, either." She lay back, her eyes suddenly closing.

He waited a moment, wondering if he should go on and tell her, but knew it was too late now to turn back.

Standing, he went to the chart and found the next date.

Then he rode the stream of time once again.

* * *

Sitting boredly at his desk in 1997, James Watson glanced with half an eye at the stack of computerized accounts he had been given to review. Across the wide, air-conditioned room a clock said 3:30; he would be unable to escape this place for another hour and a half. The tickets were in his pocket. Two theater tickets. It was odd because, until a few weeks ago, he had never felt much interest in live drama. Then he happened to glimpse Rebecca Kingsley on television and had strangely fallen in love with that fragile image. That was where he was going tonight: Rebecca Kingsley in *Medea*.

Then someone came into the room—a clerk he faintly recognized—and said in a loud voice that he had just heard on the radio that Rebecca Kingsley had died.

Watson stood up to shout, and then he was falling. A vague, indistinct gray spiral surrounded him.

Thinking quickly, he pictured in his mind a log house in the Colorado mountains surrounded by green grass and a dappling of early spring snow.

As that world emerged in front of him, he felt the tickets in his pocket and wondered what they might mean.

* * *

She was dead.

Watson stood above the bed, star-

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ing down at that thin, emaciated figure which had once been so beautiful and alive. He wondered: did she ever know? It hadn't worked—the tides had come sweeping in. He hoped against hope that Rebecca had somehow been permitted to die unaware. She had made it home—he knew that for certain. He only hoped she had been able to stay there.

Removing the two tickets from his pocket, he dropped them on the bed and let them lie there.

"Then she didn't make it?" said a voice past his shoulder.

Turning, he saw Gina. He pointed at the tickets. "She was there."

"You saw her?"

"No, but I was going to. I guess some of it must have stayed with me. I always thought she was beautiful but suddenly I wanted to see her, too."

Gina produced a single matching ticket from a pocket of her torn sweater. "Me, too." The faint lines creased her face. He knew then it was definitely over. They were growing old again. "I wonder which one it was," she said.

He turned away from the body but didn't walk away. "What do you mean?"

"It must have been one of us," she said. "Out of six hundred incidents, neglecting even one might have been enough to undo the rest. Someone lied and made it so it wouldn't work. Someone didn't do what he was supposed to."

He looked as if he had been shocked. "That's a dreadful thing to think. Five billion people are dead."

"Not us."

"We never were."

She shook her head. "Are you sure? Don't you remember how it was?"

He could recall the dreariness of that awful world back there. "It was the tides of time. We tried to beat it—she did—and failed."

"No." Gina wouldn't quit so easily. "I'm as guilty as the next person because I knew what had happened and said nothing. You see, I looked at the chart. The Battle of Hastings. The Normans were supposed to win but William the Conquerer was to have died. I must have been the next person to visit England. He was still alive."

"An oversight."

She laughed. "Don't be silly, James."

"It couldn't have been that important."

She shrugged and crossed to the still unfurled chart. Crouching down, she ran her finger across the dates. "I wonder who it was. Stye maybe, or Francis. It could have been any one of us."

"Yes. Anyone."

"We were selfish."

"But so was she."

Suddenly, impulsively, Gina began to roll up the chart. "Let's burn it," she said. ☆

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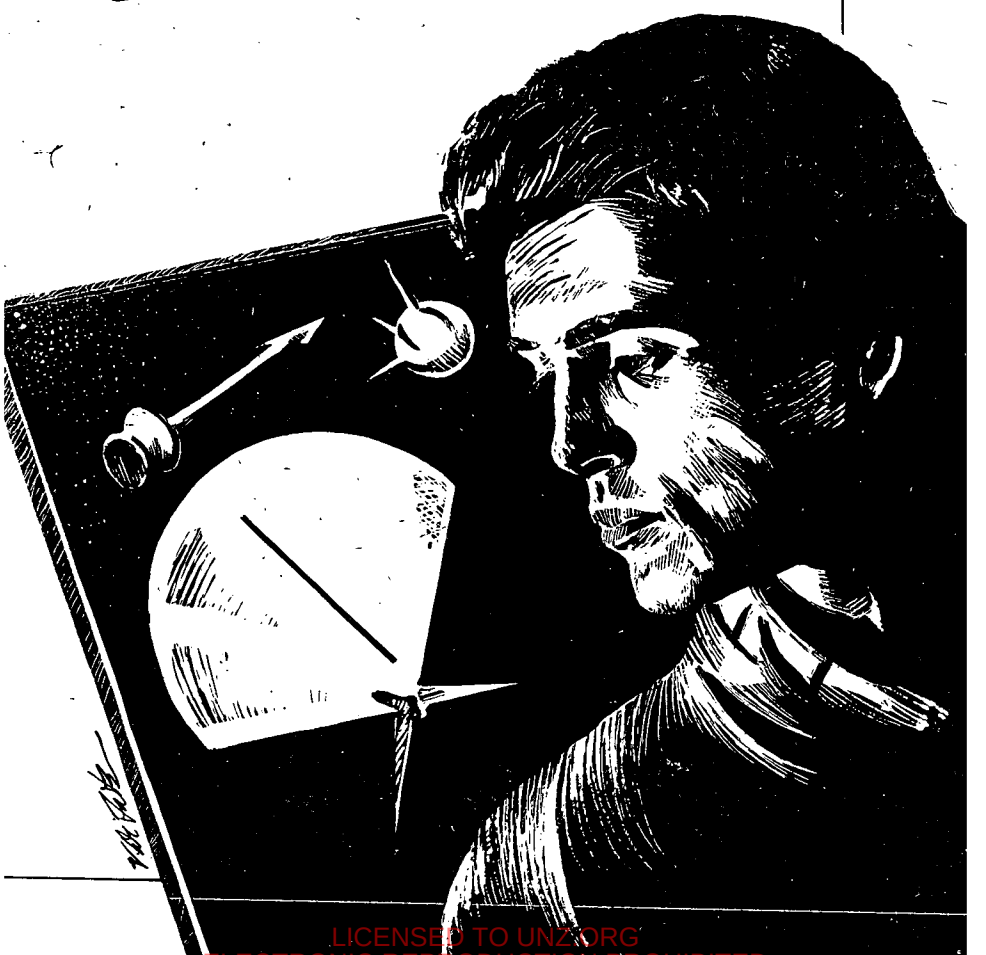
Frederik Pohl

GATEWAY



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Part III of III

WHAT HAS GONE BEFORE

By name I am Robinette Broadhead, and by profession I am rich retired millionaire. I am so rich that I can afford the best psychiatrist in New York, who happens to be a machine whom I call Sigfrid von Shrink. I suppose all that sounds pretty gay and jolly, but there's nothing funny about Sigfrid. He hurts me a lot.

Sigfrid would say that was untrue. He would say that the pain comes out of the inner parts of me, and especially out of my life, which, to be sure, has not been all pleasure. I grew up in the Wyoming food mines. You know what that's like. Sheer hell. You dig the shale, boil out the oil, grow the single-cell protein on the oil substrate–and after a while you learn to hold out a little for yourself, to ferment and drink so you can forget what kind of a life you're living. There were six or seven million of us doing that in just my part of the world when I was young. Not one of us had anything to look forward to but spending our whole lives in the hydrocarbon smog of Wyoming, with kerogen ground into the pores of our skin and the roots of our hair. But for me it turned out different. I had a stroke of luck. I won a lottery, and I came out of it with enough money to buy a one-way ticket to Gateway, and thus to possess the right to take part in the biggest lottery of them all: the chance to explore the universe for fun, profit and a first-rate shot at an early and unpleasant death. (I said it was a stroke of luck. I didn't say it was good luck.)

Gateway was Something Else. It hung out in space, waiting for people to come and find it. It wasn't a natural object. It was an artifact, the hollowed-out shell of an asteroid or maybe the core of a comet, no one was quite sure. Its surface was studded with interstellar spaceships, all fueled and aimed and ready to take off for the ends of the Galaxy. There were a couple of problems. For one, although Gateway wasn't natural, it wasn't man-made either. It was made by that long-lost and not altogether comprehensible race called the Heechee, and abandoned by them along about the time Australopithecus africanus first learned how to bash an enemy's head in with the thighbone of an antelope. For another, you never knew quite where you were going. The automatic navigation was quite efficient, but it had been preset by Heechee hands half a million years ago. When you got into a ship you might come out in orbit around a fair green planet loaded with treasure. You might also come out in the photosphere of a star. Or you might never come back at all, and no one would ever know why.

Everybody on Gateway was part of the exploration team, that was why they were there. Some were just waiting for the flight that would make them rich, like my friend Gelle-Klara Moynlin. Some were waiting for I don't know what, like my other friend Shikitei Bakin, who had lost his legs and a lot of his courage in some accident or other, and stayed on Gateway, maybe, mostly because it had so close to no gravity at all that he could get around by strapping wings to his arms and flying where he wanted to go. After I got to Gateway, and took the laughably brief course in interstellar navigation and so on (what did you have to know when the ships knew

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where they were going, and wouldn't tell?), I found I was waiting too; and what I was waiting for was to find something I had misplaced, namely my guts.

My girl-friend Sheri, who had come up with me and gone through training with me, finally got tired of watching me stall and took off on a flight without me. I didn't mind, or at least not as much as I would have minded if she had somehow forced me to go with her. There were other flights (when I got around to it), and other girls; I took up with Klara, and we hit it off beautifully. She was scared too.

But time went on, and almost everyone we knew shipped out. Somehow Klara and I got our courage together long enough to get aboard a five-man ship. . . .

And it turned out to be a bust.

We traveled God knows how many light-years, and came out too far from any interesting planet to be able to reach it; so we turned around and came back empty-handed.

That was nothing unusual. Most trips came back empty. When they came back at all. But then I got the word that Sheri's flight was back–the one I had refused to go on, remember? And they had struck it very, very rich . . . without me.

XX

I WENT BACK to my own room that night, but it took me a long time to get to sleep: and Shicky woke me up early to tell me what was happening. There had been only three survivors, and their base award had already been announced: seventeen million five hundred and fifty thousand dollars. Against royalties.

That drove the sleepies out of my eyes. "For what?" I demanded.

Shicky said, "For twenty-three kilograms of artifacts. They think it's a repair kit. Possibly for a ship, since that is where they found it, in a lander on the surface of the planet. But at least they are tools of some sort."

"Tools." I got up, and got rid of Shicky, and plodded down the tunnel to the community shower, thinking about tools. Tools could mean a lot. Tools could mean a way to open the drive mechanism in the Heechee ships without blowing up everything around. Tools could mean finding out how the drive worked, and building our own. Tools could mean almost anything, and what they certainly meant was a cash award of seventeen million five hundred and fifty thousand dollars, not counting royalties, divided three ways.

One of which could have been mine.

It is hard to get a figure like $5,850,000 out of your mind (not to mention royalties) when you think that if you had been a little more foreseeing in your choice of girlfriends you could have had it in your pocket. Call it six million dollars. At my age and health I could have bought paid-up Full Medical for less than half of that, which meant all the tests, therapies, tissue replacements and organ transplants they could cram into me for the rest of my life . . . which would have been at least fifty years longer than I could expect without it. The other three million plus would have bought me a couple of homes, a career as a lecturer (nobody was

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A NOTE ON NEUTRON STARS

Dr. Asmenion. Now, you get a star that has used up its fuel and it collapses. When I say "collapses", I mean it's shrunk so far that the whole thing, that starts out with maybe the mass and volume of the sun, is squeezed into a ball maybe ten kilometers across. That's dense. If your nose was made out of neutron star stuff, Susie, it would weigh more than Gateway does.

Question. Maybe even more than you do, Yuri?

Dr. Asmenion. Don't make jokes in class. Teacher's sensitive. Anyway, good, close-in readings on a neutron star would be worth a lot, but I don't advise you to use your lander to get them. You need to be in a fully armored Five, and then I wouldn't come much closer than a tenth of an A.U. And watch it. It'll look as though probably you could get closer, but the gravity shear is bad. It's practically a point source, you see. Steepest gravity gradient you'll ever see, unless you happen to get next to a black hole, God forbid.

---

more in demand than a successful prospector), a steady income for doing commercials on PV, women, food, cars, travel, women, fame, women . . . and, again, there were always the royalties. They could have come to anything at all, depending on what the R&D people managed to do with the tools. Sheri's find was exactly what Gateway was all about: the pot of gold at the end of the rainbow.

It took an hour for me to get down to the hospital, three tunnel segments and five levels in the dropshaft. I kept changing my mind and going back.

When I finally managed to purge my mind of envy (or at least to bury it where I didn't think it was going to show) and turned up at the reception desk, Sheri was asleep anyway. "You can go in," said the ward nurse.

"I don't want to wake her up."

"I don't think you could," he said. "Don't force it, of course. But she's allowed visitors."

She was in the lowest of three bunks in a twelve-bed room. Three or four of the others were occupied, two of them behind the isolation curtains, milky plastic that you could see through only vaguely. I didn't know who they were. Sheri herself looked quite peacefully resting, one arm under her head, her pretty eyes closed and her strong, dimpled chin resting on her wrist. Her two companions were in the same room, one asleep, one sitting under a holoview of Saturn's rings. I had met him once or twice, a Cuban or Venezuelan or something like that from New Jersey. The only name I could remember for him was Manny. We chatted for a while, and he promised to tell Sheri I had been there. I left and went for a cup of coffee at the comissary, thinking about their trip.

They had come out near a tiny, cold planet way out from a K-6 orange-red cinder of a star, and according to Manny they hadn't even been sure it was worth the trouble of landing. The readings showed Heechee-metal radiation, but not

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A NOTE ON PRAYER FANS

Question. You didn't tell us anything about Heechee prayer fans, and we see more of them than anything else.

Prof. Hegramet. What do you want me to tell you, Susie?

Question. Well I know what they *look* like. Sort of like a rolled-up ice-cream cone made out of crystal. All different colors of crystal. If you hold one right and press on it with your thumb it opens up like a fan.

Prof. Hegramet. That's what I know, too. They've been analyzed, same as fire pearls and the blood diamonds. But don't ask me what they're *for*. I don't think the Heechee fanned themselves with them, and I don't think they prayed either; that's just what the novelty dealers called them. The Heechee left them all over the place, even when they tidied everything else up. I suppose they had a reason. I don't have a clue what that reason was, but if I ever find out I'll tell you.

---

much; and almost all of it, apparently, was buried under carbon-dioxide snow. Manny was the one who stayed in orbit. Sheri and the other three went down, found a Heechee dig, opened it with great effort and, as usual, found it empty. Then they tracked another trace and found the old lander. They had to blast to get it open, and in the process two of the prospectors lost integrity of their spacesuits—too close to the blast, I guess. By the time they realized they were in trouble it was too late for them. They froze. Sheri and the other crewman tried to get them back into their own lander; it must have been pure misery and fear the whole time, and at the end they had to give up. The other man had made one more trip to the abandoned lander, found the tool kit in it, managed to get it back to their own lander. Then they had taken off, leaving the two casualties peacefully frozen behind them. But they had overstayed their limit and they were physical wrecks when they docked with the orbiter. I wasn't clear on what happened after that, but apparently they had failed to secure the lander's air supply and had lost a good deal of it; so they were on short oxygen rations all the way home. The other man was worse off than Sheri. There was a good chance of residual brain damage, and his $5,850,000 might not do him much good. But Sheri, they said, would be all right once she recovered from plain exhaustion. . . .

I didn't envy them the trip. All I envied them was the reward.

I got up and got myself another cup of coffee in the commissary. As I brought it back to the corridor outside, where there were a few benches under the ivy planters, I became aware that something was bugging me. Something about the trip. About the fact that it had been a real winner, one of the all-time greats of Gateway's history. . . .

I dumped the coffee, cup and all, into a disposal hole outside the commissary and headed for the school room. It was only a few minutes away and there was no one else there. That was good; I wasn't ready to talk to anyone yet about what had occurred to me. I keyed

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the P-phone to information access and got the settings for Sheri's trip; they were, of course, a matter of public record. Then I went down to the practice capsule, and again hit lucky because there was no one around, and set them up on the course selector. Of course, I got good color immediately; and when I pressed the fine-tuner the whole board turned bright pink, except for the rainbow of colors along the side.

There was only one dark line in the blue part of the spectrum.

Well, I thought, so much for Metchnikov's theory about danger readings. They had lost forty per cent of the crew on that mission, and that struck me as being quite adequately dangerous; but according to what he had told me the really hairy ones showed six or seven of those bands.

And in the yellow?

According to Metchnikov, the more bright bands in the yellow, the more financial reward from a trip.

Only in this one there were no bright bands in the yellow at all. There were two thick black "absorption" lines. That's all.

I thumbed the selector off and sat back. So the great brains had labored and brought forth a mouse again: what they had interpreted as an indication of safety didn't really mean you were safe, and what they had interpreted as a promise of good results didn't seem to have any relevance to the first mission in more than a year that had really come up rich.

Back to square one, and back to being scared.

For the next couple of days I kept pretty much to myself.

There are supposed to be eight hundred kilometers of tunnels inside Gateway. You wouldn't think there could be that many in a little chunk of rock that's only about ten kilometers across. But even so only about two per cent of Gateway is airspace, the rest is solid rock. I saw a lot of those eight hundred kilometers.

I didn't cut myself off completely from human companionship, I just didn't seek it out. I saw Klara now and then. I wandered around with Shicky when he was off duty, although it was tiring for him. Sometimes I wandered by myself, sometimes with chance-met friends, sometimes tagging along after a tourist group. The guides knew me and were not averse to having me along (I had been *out!* even if I didn't wear a bangle), until they got the idea that I was thinking of guiding myself. Then they were less friendly.

They were right. I was thinking of it. I was going to have to do something sooner or later. I would have to go out, or I would have to go home; and if I wanted to defer decision on either of those two equally frightening prospects, I would have to decide at least to try to make enough money to stay put.

When Sheri got out of the hospital we had a hell of a party for her, a combination of welcome home, congratulations and good-by, Sheri, because she was leaving for Earth the next day. She was shaky but cheerful, and although she wasn't up to dancing she sat hugging me in the corridor for half an hour, promising to miss me. I got quite drunk.

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Corporation Report: Orbit 37

74 vessels returned from launches during this period, with a total crew of 216. 20 additional vessels were judged lost, with a total crew of 54. In addition 19 crew members were killed or died of injuries, although the vessels returned. Three returning vessels were damaged past the point of feasible repair.

Landing reports: 19. Five of the surveyed planets had life at the microscopic level or higher; one possessed structured plant or animal life; none intelligent.

Artifacts: Additional samples or usual Heechee equipment were returned. No previously unknown Heechee artifacts.

Samples: Chemical or mineral, 145. None adjudged of sufficient value to justify exploitation. Living organic, 31. Three of these were judged hazardous and disposed of in space. None found of exploitable value.

Science awards in period: $8,754,500.

Other cash awards in period, including royalties: $357,856,000. Awards and royalties arising from new discoveries in period (other than science awards): 0.

Personnel grounded or exiting Gateway in period: 151. Lost operationally: 75 (including 2 lost in lander exercises.) Medically unfit at end of year, —4. Total losses, 310.

New personnel arriving in period: 415. Returned to duty: 66. Total increment during period: 481. Net gain in personnel: 171.

It was a good chance for it; the liquor was free. Sheri and her Cuban friend were picking up the check. In fact, I got so drunk that I never did get to say good-by to Sheri, because I had to head for the toilet and chuck. Drunk as I was, that struck me as a pity; it was genuine Scotch-from-Scotland Gleneagle, none of your local white lightning boiled out of God knows what.

Throwing up cleared my head. I came out and leaned against a wall, my face buried in the ivy, breathing hard, and by and by enough oxygen got into my bloodstream that I could recognize Francy Hereira standing next to me. I even said, "Hello, Francy."

He grinned apologetically. "The smell. It was a little strong."

"Sorry," I said huffily, and he looked surprised.

"No, what do you mean? I mean it is bad enough on the cruiser, but every time I come to Gateway I wonder how you live through it. And in those rooms—phew!"

"No offense taken," I said grandly, patting his shoulder. "I must say good night to Sheri."

"She's gone, Bob. Got tired. They took her back to the hospital."

"In that case," I said, "I will only say good night to you." I bowed and lurched down the tunnel. It is difficult being drunk in nearly zero gravity. You long for the reassurance of a hundred kilos of solid weight to hold you to the ground. I understand from what was reported to me later, that I pulled a solid rack of ivy off the wall, and I know from what I felt the next morning

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that I bashed my head into something hard enough to leave a purplish bruise the size of my ear. I became conscious of Francy coming up behind me and helping me navigate, and about halfway home I became conscious that there was someone else on my other arm. I looked, and it was Klara. I have only the most confused recollection of being put to bed, and when I woke up the next morning, desperately hung over, I was astonished to find that Klara was in it too.

I got up as inconspicuously as I could and headed for the bathroom, needing a lot to throw up some more. It took quite a while, and I topped it off with another shower, my second in four days and a wild extravagance, considering my financial state. But I felt a little better, and when I got back to my room Klara had got up, fetched tea, probably from Shicky, and was waiting for me.

"Thanks," I said, meaning it. I was infinitely dehydrated.

"A sip at a time, old horse," she said anxiously, but I knew enough not to force much into my stomach. I managed two swallows and stretched out in the hammock again, but by then I was pretty sure I would live.

"I didn't expect to see you here," I said.

"You were, ah, insistent," she told me. "Not much on performance. But awfully anxious to try."

"Sorry about that."

She reached over and squeezed my foot. "Not to worry. How've things been, anyway?"

"Oh, all right. It was a nice party. I don't remember seeing you there?"

She shrugged. "I came late. Wasn't invited, as a matter of fact."

I didn't say anything; I had been aware Klara and Sheri were not very friendly, and assumed it was because of me. Klara, reading my mind, said, "I've never cared for Scorpios, especially unevolved ones with that awful huge jaw. Never get an intelligent, spiritual thought from one of them." Then she said, to be fair, "But she has courage, you have to give her that."

"I don't believe I'm up to this argument," I said.

"Not an argument, Bob." She leaned over, cradling my head. She smelled sweaty and female; rather nice, in some circumstances, but not quite what I wanted right then.

"Hey," I said. "What ever became of musk oil?"

"What?"

"I mean," I said, suddenly realizing something that had been true for quite a while, "you used to wear that perfume a lot. That was the first thing I remember noticing about you." I thought of Francy Hereira's remark about the Gateway smell, and realized it had been a long time since I had noticed Klara smelling particularly nice.

"Honey-Bob, are you trying to start an argument with me?"

"Certainly not. But I'm curious. When did you stop wearing it?"

She shrugged and didn't answer, unless looking annoyed is an answer. It was enough of an answer for me, because I'd told her often enough that I liked the perfume. "So how are you doing with your

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shrink?" I asked, to change the subject.

It didn't seem to be any improvement. Klara said, without warmth, "I guess you're feeling pretty rotten with that head. I think I'll go home now."

"No, I mean it," I insisted. "I'm curious about your progress." She hadn't told me a word, though I knew she had signed up; and she seemed to spend two or three hours a day with him. Or it. She had elected to try the machine service from the Corporation computer, I knew.

"Not bad," she said distantly.

"Get over your father fixation yet?" I inquired.

Klara said, "Bob, did it ever occur to you that you might get some good out of a little help yourself?"

"Funny you should say that. Louise Forehand said the very same thing to me the other day."

"Not funny. Think about it. See you later."

I dropped my head back after she had gone and closed my eyes. Go to a shrink! What did I need with that? All I needed was one lucky find like Sheri's. . . .

And all I needed to make that was—was—

Was the guts to sign up for another trip.

But that kind of guts, for me, seemed to be in very short supply.

Time was slipping by, or I was destroying it, and the way I began destroying one day was to go to the museum. They had already installed a complete holo set of Sheri's find. I played the disk over two or three times, just to see what seventeen million five hundred and fifty thousand dollars looked like. It mostly looked like irrelevant junk. That was when each piece was displayed on its own. There were about ten little prayer fans, proving, I guess, that the Heechee liked to include a few art objects even with a tire-repair kit. Or whatever the rest of it was: things like triangle-bladed screwdrivers with flexible shafts, things like socket wrenches, but made of some soft material; things like electrical test probes, and things like nothing you ever saw before. Spread out item by item they seemed pretty random, but the way they fit into each other, and into the flat nested boxes that made up the set, was a marvel of packing economy. Seventeen million five hundred and fifty thousand dollars, and if I had stayed with Sheri I could have been one of the shareholders.

Or one of the corpses.

I stopped off at Klara's place and hung around for a while, but she wasn't home. It wasn't her usual time for being shrunk. On the other hand, I had lost track of Klara's usual times. She had found another kid to mother when its parents were busy: a little black girl, maybe four years old, who had come up with a mother who was an astrophysicist and a father who was an exobiologist. And what else Klara had found to keep herself busy I was not sure.

I drifted back to my own room, and Louise Forehand peered out of her door and followed me in. "Bob," she said urgently, "do you know anything about a big danger bonus coming up?"

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I made room for her on the pad. "Me? No. Why would I?" Her pale, muscular face was tauter than ever, I could not tell why.

"I thought maybe you'd heard something. From Dane Metchnikov, maybe. I know you're close to him, and I've seen him talking to Klara in the schoolroom." I didn't respond to that, I wasn't sure what I wanted to say. "There's a rumor that there's a science trip coming up that's pretty hairy. And I'd like to sign on for it."

I put my arm around her. "What's the matter, Louise?"

"They posted Willa dead."

I held her for a while and let her cry it out. I would have comforted her if I had known how, but what comfort was there to give? After a while I got up and rummaged around in my cupboard, looking for a joint Klara had left there a couple days before. I found it, lighted it, passed it to her.

Louise took a long, hard pull, and held it for quite a while. Then she puffed out. "She's dead, Bob," she said. She was over crying now, somber but relaxed; even the muscles around her neck and up and down her spine were tension-free.

"She might come back yet, Louise."

She shook her head. "Not really. The Corporation posted her ship lost. *It* might come back, maybe. Willa won't be alive in it. Their last stretch of rations would have run out two weeks ago." She stared into space for a moment, then sighed and roused herself to take another pull on the joint. "I wish Sess were here," she said, leaning back and stretching; I could feel the play of muscles against the palm of my hand.

The dope was hitting her, I could see. I knew it was hitting me. It wasn't any of our usual Gateway windowbox stuff, sneaked in among the ivy. Klara had got hold of some pure Naples Red from one of the cruiser boys, shadegrown on the slopes of Mount Vesuvius between the rows of vines that made Lacrimae Cristi wine. She turned toward me and snuggled her chin into my neck. "I really love my family," she said, calmly enough. "I wish we had hit lucky here. We're about due for some luck."

"Hush, honey," I said, nuzzling into her hair. Her hair led to her ear and her ear led to her lips, and step by step we were making love in a timeless, gentle, stoned way. It was very relaxed. Louise was competent, unanxious and accepting. After a couple of months of Klara's nervous paroxysms it was like coming

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home to Mom's chicken soup. At the end she smiled, kissed me and turned away. She was very still, and her breathing was even. She lay silent for a long time, and it wasn't until I realized that my wrist was getting damp that I knew she was crying again.

"I'm sorry, Bob," she said when I began to pat her. "It's just that we've never had any luck. Some days I can live with that fact, and some days not. This is one of the bad ones."

"You will."

"I don't think so. I don't believe it any more."

"You got here, didn't you? That's pretty lucky."

She twisted herself around to face me, her eyes scanning mine. I said, "I mean, think of how many billion people would give their left testicles to be here."

Louise said slowly, "Bob—" She stopped. I started to speak but she put her hand over my lips. "Bob," she said, "do you know how we managed to get here?"

"Sure. Sess sold his airbody."

"We sold more than that. The airbody brought a little over a hundred thousand. That wasn't enough for even one of us. We got the money from Hat."

"Your son? the one that died?"

She said, "Hat had a brain tumor. They caught it in time, or anyway almost in time. It was operable. He could have lived, oh, I don't know, ten years anyway. He would have been messed up some. His speech centers were affected, and so was his muscle control. But he could have been alive right now. Only—" She took her hand off my chest to rub it across her face, but she wasn't crying. "He didn't want us to spend the airbody money on Term Medical for him. It would have just about paid for the surgery, and then we would have been broke again. So what he did, he sold himself, Bob. He sold off all his parts. More than just a left testicle. All of him. They were fine, first-quality Nordic male twenty-two-year-old parts, and they were worth a bundle. He signed himself over to the medics and they—how do you say it?—put him to sleep. There must be pieces of Hat in a dozen different people now. They sold off everything for transplants, and they gave us the money. Close to a million dollars. Got us here, with some to spare. So that's where our luck came from, Bob."

I said, "I'm sorry."

"For what? We just don't have the luck, Bob. Hat's dead. Willa's dead. God knows where my husband is, or our one last surviving kid. And I'm here, and, Bob, half the time I wish with all my heart that I were dead too."

* * *

I left her sleeping in my bed and wandered down to Central Park. I called Klara, found her out, left a message to say where I was, and spent the next hour or so on my back, looking up at the mulberries ripening on the tree. There was no one there except for a couple of tourists taking a fast look through before their ship left. I didn't pay attention to them, didn't even hear them leave. I was feeling sorry for Louise and for all the Forehands,

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and even sorrier for myself. They didn't have the luck, but what I didn't have hurt a lot more; I didn't have the courage to see where my luck would take me. Sick societies squeeze adventurers out like grape pips. The grape pips don't have much to say about it. I suppose it was the same with Columbus's seamen or the pioneers manhandling their covered wagons through Comanche territory; they must have been scared witless, like me, but they didn't have much choice. Like me, But, God, how frightened I was. . . .

I heard voices, a child's and a light, slower laugh that was Klara's. I sat up.

"Hello, Bob," she said, standing before me with her hand on the head of a tiny black girl in corn-row hair. "This is Watty."

"Hello, Watty."

My voice didn't sound right, even to me. Klara took a closer look and demanded, "What's the matter?"

I couldn't answer that question in one sentence so I chose one facet. "Willa Forehand's been posted dead."

Klara nodded without saying anything. Watty piped, "Please, Klara. Throw the ball." Klara tossed it to her, caught it, tossed it again, all in the Gagetway adagio.

I said, "Louise wants to go on a danger-bonus launch. I think what she wants is for me, for us, to go and take her with us."

"Oh?"

"Well, what about it? Has Dane said anything to you about one of his specials?"

"No! I haven't seen Dane for—I don't know. Anyway, he shipped out this morning on a One."

"He didn't have a farewell party!" I protested, surprised. She pursed her lips. The little girl called:

"Hey, mister! Catch!" When she threw the ball it came floating up like a hot-air balloon to a mooring mast, but even so I almost missed it. My mind was on something else. I tossed it back with concentration.

After a minute Klara said, "Bob? I'm sorry. I guess I was in a bad mood."

"Yeah." My mind was very busy.

She said placatingly, "We've been having some hard times, Bob. I don't want to be raspy with you. I—I brought you something."

I looked around, and she took my hand and slid something up over it, onto my arm.

It was a launch bracelet, Heechee metal, worth five hundred dollars anywhere. I hadn't been able to afford to buy one. I stared at it, trying to think of what I wanted to say.

"Bob?"

"What?"

There was an edge to her voice. "It's customary to say thank you."

"It's customary," I said, "to give a truthful answer to a question. Like not saying you hadn't seen Dane Metchnikov when you were with him just last night."

She flared, "You've been spying on me!"

"You've been lying to me."

"Bob! You don't own me. Dane's a human being, and a friend."

"Friend!" I barked. The last

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A NOTE ON METALLURGY

Question. I saw a report that Heechee metal had been analyzed by the National Bureau of Standards—

Prof. Hegramet. No you didn't.

Question. But it was on the PV—

Prof. Hegramet. No. You saw a report that the Bureau of Standards had issued a quantitative assessment of Heechee metal. Not an analysis. Just a description: tensile strength, fracture strength, melting point, all that stuff.

Question. I'm not sure I understand the difference.

Prof. Hegramet. We finally know exactly what it *does*. We don't yet know what it *is*. What's the most interesting thing about Heechee metal? You, Teri?

Question. It glows?

Prof. Hegramet. It glows, yes. It emits light. Bright enough so that we don't need anything else to light our rooms, we have to cover it over when we want dark. And it's been glowing for half a million years at least like that. Where does the energy come from? The Bureau says there are some post-uranic elements in it, and probably they drive the radiation; but we don't know what they are. There's also something in it that looks like an isotope of copper. Well, copper doesn't *have* any stable isotopes. Up to now. So what the Bureau says is what the exact frequency of the blue light is, and all the physical measurements to eight or nine decimals; but the report doesn't tell you how to make any.

---

thing Metchnikov was to anyone was a friend. Just thinking about Klara with him made my groin crawl. I didn't like the sensation, because I couldn't identify it. It wasn't just anger, wasn't even just jealousy. There was a component that remained obstinately opaque. I said, knowing it was illogical, hearing myself seem almost to whine. "I introduced you to him!"

"That doesn't give you ownership! All right," Klara snarled, "maybe I went to bed with him a few times. It doesn't change how I feel about you."

"It changes how I feel about you, Klara."

She stared incredulously. "You have the nerve to say that? Coming here, smelling of sex with some cheap floozy?"

That one caught me off guard. "There was nothing cheap about it! I was comforting someone in pain."

She laughed. The sound was unpleasant; anger is unbecoming. "Louise Forehand? She hustled her way up here, did you know that?"

The little girl was holding the ball and staring at us now. I could see we were frightening her. I said, trying to tighten my voice to keep the anger from spilling out, "Klara, I'm not going to let you make a fool out of me."

"Ah," she said in inarticulate disgust, and turned around to go. I reached out to touch her, and she sobbed and hit me, as hard as she could. The blow caught me on the shoulder.

That was a mistake.

That's always a mistake. It isn't a matter of what's rational or justified, it is a matter of signals. It

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was the wrong signal to give me. The reason wolves don't kill each other off is that the smaller and weaker wolf always surrenders. It rolls over, bares its throat and puts its paws in the air to signal that it is beaten. When that happens the winner is physically unable to attack any more. If it were not that way, there wouldn't be any wolves left. For the same reason men don't usually kill women, or not by beating them to death. They can't. However much he wants to hit her, his internal machinery vetoes it. But if the woman makes the mistake of giving him a different signal by hitting him first—

I punched her four or five times, as hard as I could, on the breast, in the face, in the belly. She fell to the ground, sobbing. I knelt beside her, lifted her up with one hand and, in absolutely cold blood, slapped her twice more. It was all happening as if choreographed by God, absolutely inevitably; and at the same time I could feel that I was breathing as hard as though I'd climbed a mountain on a dead run. The blood was thundering in my ears. Everything I saw was hazed with red.

I finally heard a distant, thin crying.

I looked and saw the little girl, Watty, staring at me, her mouth open, tears rolling down her wide, purplish-black cheeks. I started to move toward her to reassure her. She screamed and ran behind a grape trellis.

I turned back toward Klara, who was sitting up, not looking at me, her hand cupped over her mouth. She took the hand away and stared at something in it: a tooth.

I didn't say anything. I didn't know what to say, and didn't trust myself to think of anything. I turned and left.

I don't remember what I did for the next few hours.

I didn't sleep, although I was physically exhausted. I sat on the chest of drawers in my room for a while. Then I left it again. I remember talking to somebody, I think it was a straggling tourist off the Venus ship, about how adventurous and exciting prospecting was. I remember eating something in the commissary. And all the time I was thinking: I wanted to *kill* Klara. I had been containing all that stored-up fury, and I hadn't even let myself know it was there until she pulled the trigger.

I didn't know if she would ever forgive me. I wasn't sure she ought to, and I wasn't even sure that I wanted her to. I could not imagine our ever being lovers again. But what I finally was sure I wanted was to apologize.

Only she wasn't in her rooms. There was no one there but a plump young black woman, slowly sorting out clothes, with a tragic face. When I asked after Klara she began to cry. "She's gone," the woman sobbed.

"Gone?"

"Oh, she looked awful. Someone must have beaten her up! She brought Watty back and said she wouldn't be able to take care of her any more. She gave me all her clothes, but—what am I going to do with Watty when I'm working?"

"Gone where?"

The woman lifted her head. "Back to Venus. On the ship. It

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left an hour ago."

Somehow I got to sleep, alone in my own bed. I didn't talk to anyone else.

When I got up I gathered together everything I owned: My clothes, my holodisks, my chess set, my wristwatch. The Heechee bracelet that Klara had given me. I went around and sold them off. I cleaned out my credit account and put all the money together: it came to a total of fourteen hundred dollars and change. I took the money up to the casino and put it all on Number 31 on the roulette wheel.

The big slow ball drifted into a socket: Green. Zero.

I went down to mission control and signed for the first One that was available, and twenty-four hours later I was in space.

XXIII

"How do you really feel about Dane, Bob?"

"How the hell do you think I feel? He seduced my girl."

"That's a strangely old-fashioned way to put it, Bob. And it happened an awfully long time ago."

"Sure it did." Sigfrid strikes me as being unfair. He sets up rules, then he doesn't play by them. I say indignantly, "Cut it out, Sigfrid. All that *happened* a long time ago, but it isn't *being* a long time ago, for me, because I've never let it come out. It's still brand-new inside my head. Isn't that what you're supposed to do for me? Let all that old stuff inside my head come out so it can dry up and blow away and not cripple me any more?"

"I'd still like to know why it stays so brand-new inside your head, Bob."

"Oh, Christ, Sigfrid!" This is one of Sigfrid's stupid times. He can't handle some complex kinds of input, I guess. When you come right down to it he's only a machine and can't do anything he isn't programmed to do. Mostly he just responds to key words—well, with a little attention to meaning, sure. And to nuance, as far as it is expressed by voice tone, or by what the sensors in the pad and straps tell him about my muscle activity.

"If you were a person instead of a machine, you'd understand," I tell him.

"Perhaps so, Bob."

To get him back on the right track I say: "It is true that it happened a long time ago. I don't see what you're asking beyond that."

"I'm asking you to resolve a contradiction I perceive in what you say. You've been saying that you don't mind the fact that your girl friend, Klara, had sexual relations with other men. Why is it so important that she did with Dane?"

"Dane didn't treat her right!" And, good God, he certainly didn't. He left her stuck like a fly in amber.

"Is it because of how he treated Klara, Bob? Or is it something between Dane and you?"

"Never! There was never anything between Dane and me!"

"You did tell me he was bi, Bob. What about on the flight you took with him."

"He had two other men to play with! Not me, boy, no, I swear! Not me. Oh," I said, trying to calm my voice enough to make it reflect

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the very mild interest I really felt in this stupid subject, "to be sure, he tried to put the make on me once or twice. But I told him it wasn't my style."

"Your voice, Bob," he says, "seems to reflect more anger than your words account for."

"Damn you, Sigfrid!" I really am angry now, I admit it. I can hardly get the words out. "You get me pissed off with your wild accusations. Sure, I let him put his arm around me once or twice. That's as far as I went. Nothing serious. I was just abusing myself to make the time pass. I liked him well enough. Big, goodlooking fellow. You get lonesome when—Now what?"

Sigfrid was making a sound, sort of like clearing one's throat. It is how he interrupts without interrupting. "What did you just say, Bob?"

"What? When?"

"When you said there was nothing serious between you."

"Christ, I don't know what I said. There was nothing serious, that's all. I was just entertaining myself, to make the time pass."

"You didn't use the word 'entertaining', Bob."

"I didn't? What word did I use?"

I reflect, listening for the echo of my own voice. "I guess I said 'amusing myself'. What about it?"

"You didn't say 'amusing' either, Bob. What did you say?"

"I don't know!"

"You said, 'I was just abusing myself', Bob."

My defenses go up. I feel as though I had suddenly discovered I had wet my pants, or that my fly was open. I step outside my body and look at my own head.

"What does 'abusing myself' mean to you, Bob?"

"Say," I say, laughing, genuinely impressed and amused at the same time, "that's a real Freudian slip, isn't it? You fellows are pretty keen. My compliments to the programmers."

Sigfrid doesn't respond to my urbane comment. He just lets me stew in it for a minute.

"All right," I say. I feel very open and vulnerable, letting nothing at all happen, living in that moment as though it were lasting forever, like Klara stuck in her instant and eternal fall.

Sigfrid says gently, "Bob. When you masturbated, did you ever have fantasies about Dane?"

A NOTE ON HEECHEE HABITAT

Question. Don't we even know what a Heechee table or any old housekeeping thing looks like?

Prof. Hegramet. We don't even know what a Heechee house looks like. We never found one. Just tunnels. They liked branching shafts, with rooms opening out of them. They liked big chambers shaped like spindles, tapered at both ends, too. There's one here, two on Venus, probably the remains of one that's half eroded away on Peggy's World.

Question. I know what the bonus is for finding intelligent alien life, but what's the bonus for finding a Heechee?

Prof. Hegramet. Just find one. Then name your price.

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"I hated it," I said.

He waits.

"I hate myself for it. I mean, not hated, exactly. More like despised. Poor God-damn son of a bitch, me, all kinky and awful, beating his meat and thinking about being screwed by his girl's lover."

Sigfrid waits me out for a while. Then he says, "I think you really want to cry, Bob."

He's right, but I don't say anything.

"Would you like to cry?" he invited.

"I'd love it," I say.

"Then why don't you go ahead and cry, Bob?"

"I wish I could," I say. "Unfortunately, I just don't know how."

XXIV

I was just turning over, making up my mind to go to sleep, when I noticed that the colors on the Heechee guidance system were breaking up. It was the fifty-fifth day of my trip, the twenty-seventh since turnover. The colors had been shocking pink for the whole fifty-five days. Now whorls of pure white formed, grew, clotted together.

I was arriving! Wherever it was going to turn out to be when I got there, I was arriving.

My little old ship—the smelly, hurtful, tedious coffin I had been banging around in for nearly two months by myself, talking to myself, playing games with myself, tired of myself—was well below lightspeed. I leaned over to look at the viewscreen, now relatively "down" to me because I had been decelerating, and saw nothing that looked very exciting. Oh, there was a star, yes. There were lots of stars in a scattering of groupings that in no way looked familiar; half a dozen blues ranging from bright to hurt-the-eyes; a red one that stood out more for intensity of hue than luminosity. It was an angry-looking red coal, not much brighter than Mars is from Earth, but a deeper, uglier red.

I made myself take an interest.

That was not really easy. After fifty-seven days of rejecting everything around me because it was boring or threatening, it was hard for me to switch over to a welcoming, vulnerable mode. I switched on the spherical scan and peered out as the ship began to rotate in its scanning pattern, slicing orange-peel strips of sky to capture in the cameras and analyzers.

And almost at once I got a huge, bright, nearby signal return.

Fifty-seven days of boredom and exhaustion went right out of my mind. There was something either very big or very close. I forgot about being sleepy. I crouched over the viewscreen, holding on with hands and knees, and then I saw it: a squared-off object marching into the screen. Glowing all over. Pure Heechee metal! It was irregularly slab-sided, with rounded pimples studding one of the flat sides.

And the adrenalin began to flow, and visions of sugarplums danced in my head. I watched it out of sight, and then hauled myself over to the scan analyzer, waiting to see what would come out. There was no question that it was good, the only question was *how* good. Maybe ex-

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traordinarily good! Maybe a whole Peggy's World all my own!—with a royalty in the millions of dollars every year all the rest of my life! Maybe only a vacant shell. Maybe—the squared-off shape suggested it—maybe that wildest of dreams, a whole *big* Heechee ship that I could enter into and fly around anywhere I chose, big enough to carry a thousand people and a million tons of cargo! All those dreams were possible; and even if they all failed, if it was just an abandoned shell, all that it needed was one thing inside it, one little tinkertoy, one gadget, one whozie that nobody had ever found before that could be taken apart and reproduced and made to work—

I stumbled and raked my knuckles against the spiral gadget, now glowing soft gold. I sucked the blood off them and realized the ship was moving.

It shouldn't have been moving! It wasn't programmed to do that. It was meant to hang in whatever orbit it was programmed to find, and just stay there until I looked around and made my decisions.

I stared around, confused and baffled. The glowing slab was firmly in the middle of the viewscreen now and it stayed there; the ship had stopped its automatic spherical scan. Belatedly I heard the distant high yell of the lander motors. They were what were moving me; my ship was targeted for that slab.

And a green light was glowing over the pilot's seat.

That was wrong! The green light was installed on Gateway by human beings. It had nothing to do with the Heechee; it was the plain old people's radio circuit, announcing that someone was calling me. Who? Who could be anywhere near my brand-new discovery?

I thumbed on the TBS circuit and shouted, "Hello?"

There was an answer. I didn't understand it; it seemed to be in some foreign language, perhaps Chinese. But it was human all right. "Talk English!" I yelled. "Who the hell are you?"

Pause. Then another voice. "Who are *you*?"

"My name is Broadhead," I snarled.

"Broadhead?" Confused mumbling of a couple of voices. Then the English-speaking voice again: "We don't have any record of a prospector named Broadhead. Are you from Aphrodite?"

"What's Aphrodite?"

"Oh, Christ! Who *are* you? Listen, this is Gateway Two control and we don't have time to screw around. Identify yourself!"

Gateway Two!

Mission Report

Vessel 3-104, Voyage 031D18. Crew N. Ahoya, Ts. Zakharcenko, L. Marks.

Transit time 119 days 4 hours. Position not identified. Apparently outside galactic cluster, in dust cloud. Identification of external galaxies doubtful.

Summary. "We found no trace of any planet, artifact or landable asteroid within scanning distance. Nearest star approximately 1.7 l.y. Conjecture whatever was there has since been destroyed. Life-support systems began to malfunction on return trip and Larry Marks died."

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I snapped off the radio and lay back, watching the slab grow larger, ignoring the demand of the green light. Gateway Two? How ridiculous! If I had wanted to go to Gateway Two I would have signed up in the regular course and accepted the penalty of paying royalties on anything I might find. I would have flown out secure as any tourist, on a course that had been tested a hundred times. I hadn't done that. I had picked a setting no one else had ever used, and taken my risks. And I had felt every one of them, scared out of my brain for fifty-seven bad days.

It wasn't fair!

I lost my head. I lunged toward the Heechee course director and shoved the wheels around at random.

It was a failure I couldn't accept. I was braced to find nothing. I was not braced to find I had done something easy, for no reward at all.

But what I produced was a bigger failure still. There was a bright yellow flash from the course board, and then all the colors went black.

The thin scream from the lander motors stopped.

The feeling of motion was gone. The ship was dead. Nothing was moving. Nothing worked in the Heechee complex; nothing, not even the cooling system.

By the time Gateway Two sent a ship out to haul me in I was delirious with heatstroke, in an ambient temperature of 75°C.

Gateway was hot and dank. Gateway Two was cold enough that I had to borrow jacket, gloves and heavy underwear. Gateway stank of sweat and sewers. Gateway Two tasted of rusty steel. Gateway was bright and loud and full of people. On Gateway Two there was almost no sound, and only seven human beings, not counting myself, to make any. The Heechee had left Gateway Two not quite completed. Some of the tunnels ended in bare rock, and there were only a few dozen of them. No one had got around to planting vegetation yet, and all the air there was came from chemical processors; the partial pressure of 0_2 was under 150 millibars, and the rest of the atmosphere was a nitrogen-helium mix, not much more than half earth-normal pressure altogether, that made the voices highpitched and left me gasping for the first few hours.

The man who helped me out of my lander and bundled me up against the sudden cold was a dark, immense Martian-Japanese named Norio Ituno. He put me in his own bed, filled me with liquids and let me rest for an hour. I dozed, and when I woke up he was sitting there, looking at me with amusement and respect. The respect was for someone who had slain a five-hundred-million-dollar ship. The amusement was that I was idiot enough to do it.

"I guess I'm in trouble," I said.

"I would say so, yes," he agreed. "The ship is totally dead. Never saw anything like it before."

"I didn't know a Heechee ship *could* go dead like that."

He shrugged. "You did something original, Broadhead. How are you feeling?" I sat up to answer him, and he nodded. "We're pretty busy right now. I'm going to have

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Dear Voice of Gateway:

Are you a reasonable and open-minded person? Then prove it by reading this letter all the way through to the end before making up your mind about what it says. There are thirteen occupied levels in Gateway. There are thirteen residences in each of thirteen (count them yourself) of the housing halls. Do you think this letter is just silly superstition? Then look at the evidence for yourself! Launches 83-20, 84-1 and 84-10 (what do the digits add up to?) were *all* declared overdue in List 86-13! Gateway Corporation, wake up! Let the skeptics and bigots jeer. Human lives depend on your willingness to risk a little ridicule. It would cost nothing to omit the Danger Numbers from all programs—except courage!

M. Gloyner, 88-331

---

to let you take care of yourself for a couple of hours—if you can?—fine. Then we'll have a party for you."

"Party!" It was the farthest thing from my mind. "For what?"

"We don't meet someone like you every day, Broadhead," he said admiringly, and left me to my thoughts.

I didn't like my thoughts very much, and after a while I got up, put on the gloves, buttoned up the jacket and started exploring. It didn't take long; there wasn't much there. I heard sounds of activity from the lower levels, but the echoes traveled at queer angles along the empty corridors and I saw no one. Gateway Two didn't have a tourist trade, and so there wasn't any night club or casino, no restaurant that I could find . . . not even a latrine. After a little while that question began to seem urgent. I reasoned that Ituno would have had to have something like that near his room, and tried to retrace my steps to there, but that didn't work either. There were cubicles along some of the corridors, but they were unfinished. No one lived there, and no one had troubled to install plumbing.

It was not one of my better days.

When I finally found a toilet I puzzled over it for ten minutes and would guiltily have left it impolitely soiled if I had not heard a sound outside the cubicle. A plump little woman was standing there, waiting.

"I don't know how to flush it," I apologized.

She looked me up and down. "You're Broadhead," she stated, and then: "Why don't you go to Aphrodite?"

"What's Aphrodite—no, wait. First, how do you flush this thing? Then, what's Aphrodite?"

She pointed to a button on the edge of the door; I had thought it was a light switch. When I touched it the whole bottom of the seamless bowl began to glow and in ten seconds there was nothing inside but ash, then nothing at all. "Wait for me," she commanded, disappearing inside. When she came out she said:

"Aphrodite's where the money

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is, Broadhead. You're going to need it."

I let her take my arm and pull me along. Aphrodite, I began to understand, was a planet. A new one, that a ship from Gateway Two had opened up less than forty days earlier, and a big one. "You'd have to pay royalty, of course," she said. "And so far they haven't found anything big, just the usual Heechee debris. But there's thousands of square miles to explore, and it'll be two months before the first batch of prospectors starts coming out from Gateway. We only sent the word back forty days ago. Have you had any hot-planet experience?"

"Hot-planet experience?"

"I mean," she explained, pulling me down a drop-shaft and calling up to me, "have you ever explored a planet that's hot?"

"—No. As a matter of fact, I haven't had any experience at all, that counts for anything. One trip. Empty. I didn't even land."

"Pity," she said. "Still, there's not that much to learn. You know what Venus is like? Aphrodite's just a little bit worse. The primary's a flare star, and you don't want to be caught in the open. But the Heechee digs are all underground. If you find one, you're in."

"What are the chances of finding one?" I asked.

"Well," she said thoughtfully, pulling me off the cable and down a tunnel, "not all that good, maybe. After all, you're out in the open when you're prospecting. On Venus they use armored airbodies and they zap around anywhere they want to go, no trouble. Well, maybe a *little* trouble," she conceded. "But they don't lose very many prospectors any more. Maybe one per cent."

"What per cent do you lose on Aphrodite?"

"More than that. Yes, I grant you, it's higher than that. You have to use the lander from your ship, and of course it's not very mobile on the surface of a planet. Especially a planet with a surface like molten sulfur and winds like hurricanes—when they're mild."

"It sounds charming," I said. "Why aren't you out there now?"

"Me? I'm an outpilot. I'm going back to Gateway in about ten days, soon as I get a cargo loaded, or somebody comes in and wants a ride back."

"I want a ride back right now."

"Oh, cripes, Broadhead! Don't you know what kind of trouble you're in? You broke regulations by messing with the control board. They'll throw the book at you."

I thought it over carefully. Then I said, "Thanks, but I think I'll take my chances."

"Don't you understand? Aphro-

We sniff for your scent
in the gas of Orion,

We dig for your den
with the dogs of Procyon,

From Baltimore, Buffalo,
Bonn and Benares

We seek you round Algol,
Arcturus, Antares.

We'll find you some day.

Little lost Heechee,
we're on our way!

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dite has *guaranteed* Heechee remains. You could take a hundred trips without finding anything like this."

"Sweetie," I said, "I couldn't take a hundred trips for anything, not now and not ever. I don't know if I can take one. I *think* I have the guts to get back to Gateway. Beyond that, I don't know."

* * *

I was on Gateway Two, altogether, thirteen days. Hester Bergowiz, the outpilot, kept trying to talk me into going to Aphrodite, I guess because she didn't want me taking up valuable cargo space on her return flight. The others didn't care. They only thought I was crazy. I was a problem for Ituno, who was loosely in charge of keeping things straight on Two. Technically I was an illegal entrant, without a dime's worth of per capita paid and with nothing to pay it with. He would have been within his rights to toss me out into space without a suit. He solved it by putting me to work loading low-priority cargo into Hester's Five, mostly prayer fans and samples for analysis from Aphrodite. That took two days, and then he designated me a chief gofer for the three people who were rebuilding suits for the next batch of explorers of Aphrodite. They had to use Heechee torches to soften the metal enough to bend it onto the suits, and I wasn't trusted with any of that. It takes two years to train a person to handle a Heechee torch in close quarters. But I was allowed to muscle the suits and sheets of Heechee metal into position for them, to fetch tools, to go for coffee . . . and to put the suits on when they were finished, and exit into space to make sure they didn't leak.

None of them leaked.

On the twelfth day two Fives came in from Gateway, loaded with happy, eager prospectors bringing all the wrong equipment. The word about Aphrodite had not had time to get to Gateway and back, so the new fish didn't know what goodies were in store. Just by accident, one of them was a young girl on a science mission, a former student of Professor Hegramet's who was supposed to make anthropometric studies of Gateway Two. On his own authority Norio Ituno reassigned her to Aphrodite, and decreed a combination welcome and farewell party. The ten newcomers and I outnumbered our hosts, but what they lacked in numbers they made up in drinking and it was a good party. I found myself a celebrity.

The new fish couldn't get over the fact that I had slain a Heechee ship and survived.

I was almost sorry to leave . . . not counting being scared.

Ituno splashed three fingers of rice whiskey into a glass for me and offered me a toast. "Sorry to see you go, Broadhead," he said. "Sure you won't change your mind? We've got more armored ships and suits than we have prospectors right now, but I don't know how long that's going to last. If you change your mind after you get back—"

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"I'm not going to change my mind," I said.

"Banzai," he said, and drank. "Listen, do you know an old guy named Bakin?"

"Shicky? Sure. My neighbor."

"Give him my regards," he said, pouring another drink for the purpose. "He's a great guy, but he reminds me of you. I was with him when he lost his legs: got caught in the lander when we had to jettison. Damn near died. By the time we got him to Gateway he was all swelled up and smelled like hell; we had to take the legs off, two days out. I did it myself."

"He's a great person, all right," I said absently, finishing the drink and holding the glass out for more. "Hey. What do you mean, he reminds you of me?"

"Can't make up his mind, Broadhead. He's got a stake that's enough to put him on Full Medical, and he can't make up his mind to spend it. If he spends it he can have his legs back and go out again. But then he'd be broke if he didn't score. So he just stays on, a cripple."

I put the glass down. I didn't want any more to drink. "So long, Ituno," I said. "I'm going to bed."

I spent most of the trip back writing letters to Klara that I didn't know if I would ever mail. There wasn't much else to do. Hester turned out to be surprisingly sexual, for a small plump lady of a certain age, but there's a limit to how long that is entertaining and with all the cargo we had jammed in the ship there wasn't room for much else. The days were all the same: sex, letter writing, sleeping . . . and

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worrying.

Worrying about why Shicky Bakin wanted to stay a cripple; which was a way of worrying in a way I could face about why I did.

XXV

Sigfrid says, "You sound tired, Bob."

Well, that was understandable enough. I had gone off to Hawaii for the weekend. Some of my money was in tourism there, so it was all tax deductible. It was a lovely couple of days on the Big Island, with a two-hour stockholders' meeting in the morning, and afternoons with one of those beautiful Island girls on the beach or sailing in glass-bottomed catamarans, watching the big mantas glide underneath begging for crumbs. But coming back you fight time zones all the way, and I was exhausted.

Only that is not the sort of thing that Sigfrid really wants to hear

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about. He doesn't care if you're physically exhausted. He doesn't care if you've got a broken leg, he only wants to know if you dream about screwing your mother.

I say that. I say, "I'm tired, all right, Sigfrid, but why don't you stop making small talk? Get right into my Oedipal feelings about Ma."

"Did you have any, Bobby?"

"Doesn't everybody?"

"Do you want to talk about them, Bobby?"

"Not particularly."

He waits, and I wait too. Sigfrid has been being cute again, and now his room is fixed up like a boy's room from forty years ago. Crossed pingpong paddles hologrammed on the wall. A fake window with a fake view of the Montana Rockies in a snowstorm. A hologrammed cassette shelf of boys' stories on tape, *Tom Sawyer* and *Lost Race of Mars* and—I can't read the rest of the titles. It is all very homey, but not in the least like my own room as a boy, which was tiny, narrow and almost filled by the old sofa I slept on.

"Do you know what you do want to talk about, Rob?" Sigfrid probes gently.

"You bet." Then I reconsider. "Well, no. I'm not sure." Actually I do know. Something had hit me on the way back from Hawaii, very hard. It's a five-hour flight. Half the time I had spent drenched in tears. It was funny. There was this lovely hapi-haole girl flying east in the seat next to me, and I had decided right away to get to know her better. And the stewardess was the same one I'd had before, and she I already knew better.

So there I was, sitting at the very back of the first-class section of the SST, taking drinks from the stewardess, chatting with my pretty hapi-haole. And—every time the girl was drowsing, or in the ladies' room, and the stewardess was looking the other way—racked with silent, immense, tearful sobs.

And then one of them would look my way again and I would be smiling, alert and on the make.

"Do you want to just say what you're feeling at this second, Bob?"

"I would in a minute, Sigfrid, if I knew what it was."

"Don't you know, really? Can't you remember what was in your head while you weren't talking, just now?"

"Sure I can!" I hesitate, then I say, "Oh, hell, Sigfrid, I guess I was just waiting to be coaxed. I had an insight the other day, and it hurt. Oh, wow, you wouldn't believe how it hurt. I was crying like a baby."

"What was the insight, Bobby?"

"I'm trying to tell you. It was about—Well, it was partly about my mother. But it was also about, well, you know, Dane Metchnikov. I had—these—I had—"

"I think you're trying to say something about the fantasies you had of having anal sex with Dane Metchnikov, Bob. Is that right?"

"Yeah. You remember good, Sigfrid. When I was crying, it was about my mother. Partly. . . ."

"You told me that, Bob."

"Right." And I close up. Sigfrid waits. I wait, too. I suppose I want to be coaxed some more, and after

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Dearest Father, Mother, Marisa and Pico-Joao,

Please tell Susie's father that she is very well and is regarded with favor by her officers. You can decide for yourselves whether to tell him that she has been seeing much of my friend Rob Broadhead. He is a good man and a serious one, but he is not a fortunate one. Susie has applied for leave to go on a mission, and if the captain grants it she speaks of going with Broadhead. We all speak of going, but as you know, we do not all do it, so perhaps it is not to be worried about.

This must be very short; it is almost docking time, and I have a 48 for Gateway.

With all love,
Francescito

---

a while Sigfrid obliges me:

"Let's see if I can help you, Bob," he says. "What do crying about your mother, and your fantasies about anal sex with Dane, have to do with each other?"

I feel something happening inside of me. It feels as though the soft, wet inside of my chest is starting to bubble into my throat. I can tell that when my voice comes out it is going to be tremulous and desperately forlorn if I don't control it. So I try to control it, although I know perfectly well that I have no secrets of this sort from Sigfrid; he can read his sensors and know what is going on inside me from the tremble of a triceps or the dampness of a palm.

But I make the effort anyway. In the tones of a biology instructor explaining a prepared frog I say: "See, Sigfrid, my mother loved me. I knew it. You know it. It was a logical demonstration; she had no choice. And Freud said once that no boy who is certain he was his mother's favorite ever grows up to be neurotic. Only—"

"Please, Robby, that isn't quite right, and besides you're intellectualizing. You know you really don't want to put in all these preambles. You're stalling, aren't you?"

Other times I would tear the circuits out of his chips for that, but this time he has my mood gauged correctly. "All right. But I *did* know that my mother loved me. She couldn't help it! I was her only son. My father was dead—don't clear your throat, Sigfrid, I'm getting to it. It was a logical necessity that she loved me, and I understood it that way with no doubt at all in my mind, but she never said so. Never once."

"You mean that never, in your whole life, did she say to you, 'I love you, son?' "

"No!" I scream. Then I get control again. "Or not directly, no. I mean, once when I was like eighteen years old and going to sleep in the next room, I heard her say to one of her friends—girl friends, I mean—that she really thought I was a tremendous kid. She was proud of me. I don't remember what I'd done, something, won a prize or got a job, but she right that minute was proud of me and loved me, and said so. . . . But not to me."

"Please go on, Bob," Sigfrid says after a moment.

"I *am* going on! Give me a min-

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ute. It hurts; I guess it's what you call primal pain."

"Please don't diagnose yourself, Bob. Just say it. Let it come out."

"Oh, *shit*."

I reach for a cigarette and then stop the motion. That's usually a good thing to do when things get tight with Sigfrid, because it will almost always distract him into an argument about whether I am trying to relieve tension instead of dealing with it; but this time I am too disgusted with myself, with Sigfrid, even with my mother. I want to get it over with. I say: "Look, Sigfrid, here's how it was. I loved my mother a lot, and I know—knew!—she loved me. But she wasn't very good at showing it."

I suddenly realize I have a cigarette in my hands, and I'm rolling it around without lighting it and, wondrous to say, Sigfrid hasn't even commented on it. I plunge right on: "She didn't say the words to me. Not only that. It's funny, Sigfrid, but you know, I can't remember her ever touching me. I mean, not *really*. She would kiss me goodnight, sometimes. On the top of the head. And I remember she told me stories. And she was always there when I needed her. But—"

I have to stop for a moment, to get control of my voice again. I inhale deeply and evenly through my nose, concentrating on breath flow.

"But you see, Sigfrid," I say, rehearsing the words ahead of time and pleased with the clarity and balance with which I deliver them, "she didn't *touch* me much. Except for one way. She was very good to me when I was sick. I was sick a lot. Everybody around the food mines has runny noses, skin infections—you know. She got me everything I needed. She was there, God knows how, holding down a job and taking care of me, all at once. And when I was sick, she—"

After a moment Sigfrid says, "Go on, Robby. Say it."

I try, but I am still stuck, and he says:

"Just say it the fastest way you can. Get it out. Don't worry if I understand, or if it makes sense. Just get rid of the words."

"Well, she would take my temperature,," I explain. "You know? Stick a thermometer into me. And she'd hold me for, you know, whatever it is, three minutes or so. And then she'd take the thermometer out and read it."

I am right on the verge of bawling. I'm willing to let it happen, but first I want to follow this thing through; it is almost a sexual thing, like when you are getting right up to the moment of decision with some person and you don't think you really want to let her be that much a part of you but you go ahead anyhow. I save up voice control, measuring it out so that I won't run out before I finish. Sigfrid doesn't say anything, and after a moment I manage the words:

"You see how it is, Sigfrid? It's funny. All my life now—what is it, maybe forty years since then? And I still have this crazy notion that being loved has something to do with having things stuck up my ass."

XXVI

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There had been a lot of changes on Gateway while I was out. The head tax had been raised. The Corporation wanted to get rid of some of the extra hangers-on, like Shicky and me; bad news: it meant that my prepaid per capita wasn't good for two or three weeks, it was only good for ten days. They had imported a bunch of double-domes from Earth, astronomers, xenotechs, mathematicians, even old Professor Hegramet was up from Earth, bruised from the lift-off deltas but hopping spryly around the tunnels.

One thing that hadn't changed was the Evaluation Board, and I was impaled on the hot seat in front of it, squirming while my old friend Emma told me in great detail what a fool I was.

Mr. Hsien was actually doing the telling, Emma only translated. But she loved her work.

"I warned you you'd fuck up, Broadhead. You should have listened to me. Why did you change the setting?"

"I told you. When I found out I was at Gateway Two I just couldn't handle it. I wanted to go somewhere else."

"Extraordinarily stupid of you, Broadhead."

I glanced at Hsien. He had hung himself up on the wall by his rolled-up collar and was hanging there, beaming benignly, hands folded. "Emma," I said, "do whatever you want to do, but get off my back."

She said sunnily, "I am doing what I want to do, Broadhead, because it's what I have to do. It's my job. You knew it was against the rules to change the settings."

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Mission Report

Vessel 1-103, Voyage 022D18./ Crew G. Herron.

Transit time out 107 days 5 hours. *Note*: Transit time return 103 days 15 hours.

Extract from log. "At 84 days 6 hours out the Q instrument began to glow and there was unusual activity in the control lights. At the same time I felt a change in the direction of thrust. For about one hour there was continuing changes, then the Q light went out and things went back to normal."

Conjecture: course change to avoid some transient hazard, perhaps a star or other body? Recommend computer search of trip logs for similar events.

"What rules? It was *my* ass that was on the line."

"The rules that say you shouldn't destroy a ship," she explained. I didn't answer, and she chirped some sort of translation to Hsien, who listened gravely, pursed his lips and then delivered two neat paragraphs in Mandarin. You could hear the punctuation.

"Mr. Hsien says," said Emma, "that you are a very irresponsible person. You have killed an irreplaceable piece of equipment. It was not your property. It belonged to the whole human race." He lilted a few more sentences, and she finished: "We cannot make a final determination of your liability until we have further information about the condition of the ship you damaged. According to Mr. Ituno he will have a complete check made of the ship at the first opportunity. There were two xenotechs in transit for the new planet, Aphrodite, at the time of his report. They will have reached Gateway Two by now, and we can expect their findings, probably, with the next outpilot. Then we will call you again."

She paused, looking at me, and I took it the interview was over. "Thanks a lot," I said, and pushed myself toward the door. She let me get all the way to it before she said:

"One more thing. Mr. Ituno's report mentions that you worked on loading and fabricating suits on Gateway Two. He authorizes a per diem payment to you amounting to, let me see, twenty-five hundred dollars. And your out-captain, Hester Bergowiz, has authorized payment of one per cent of her bonus to you for services during the return flight; so your account has been credited accordingly."

"I didn't have a contract with her," I said, surprised.

"No. But she feels you should have a share. A small share, to be sure. Altogether—" she looked under a paper—" it comes to twenty-five hundred plus fifty-five hundred, eight thousand dollars your account has been credited with."

Eight thousand dollars! I headed for a drop-shaft, grabbed an upcable and pondered. It was not enough to make any real difference. It certainly would not be enough to pay the damages they would soak me for messing up a ship. There wasn't enough money in the universe to pay that, if they wanted to charge me full replacement cost; there was no way to replace it.

On the other hand, it was eight thousand dollars more than I'd had.

I celebrated by buying myself a drink at the Blue Hell. While I was

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A NOTE ON BLACK HOLES

Dr. Asmenion. Now, if you start with a star bigger than three solar masses and it collapses, it doesn't just turn into a neutron star. It keeps on going. It gets so dense that the escape velocity exceeds thirty million centimeters a second . . . which is. . . ?

Question. Uh. The speed of light?

Dr. Asmenion. Right on, Gallina. So light can't escape. So it's black. So that's why it's called a black hole—only, if you get close enough, inside what's called the ergosphere, it isn't black. You probably could see something.

Question. What would it look like?

Dr. Asemnion. Beats the ass off me, Jer. If anybody ever goes and sees one, he'll come back and tell us if he can. Only he probably can't. You *could* maybe get that close in, get your readings and come back—and collect, Jesus, I don't know, a million dollars anyway. If you could get into your lander, see, and kick the main mass of the ship away, backward, slowing it down, you might be able to give yourself enough extra velocity to get away. Not easily. But maybe, if things were just right. But then where would you go? You can't get home in a lander. And doing it the other way wouldn't work, there isn't enough mass in a lander to get you free. . . . I see old Bob isn't enjoying this discussion, so let's move on to planetary types and dust clouds.

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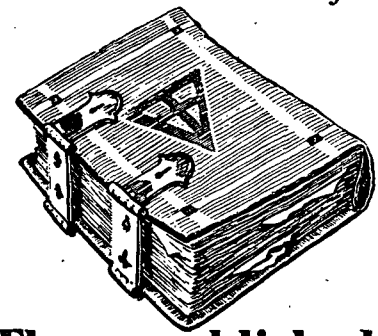

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drinking it, I thought about my options. The more I thought about them, the more they dwindled away.

They would find me culpable, no doubt about that; and the least they'd assess me would be somewhere in the hundreds of thousands of dollars. Well, I didn't have it. It might be a lot more, but that didn't make any difference; once they take away all you have there isn't anything left anyway.

So when you came right down to it, my eight thousand dollars was fairy gold. It could vanish with the morning dew. As soon as the xenotech's report came in from Gateway Two the Board would reconvene and that would be the end of that.

So there was no particular reason to stretch my money. I might as well spend it.

There was no reason, either, to think about getting back my old job as an ivy-planter . . . even assuming I could get it, with Shicky fired from his job as straw-boss. The minute they made a judgment against me my credit balance would disappear. So would my prepaid per-capita payment. I would be subject to immediate defenestration.

If there happened to be an Earth-bound ship in port at the time I could just get on board, and sooner or later I would be back in Montana looking for my old job at the food mines. If there wasn't a ship, then I was in trouble. I *might* be able to talk the American cruiser, or maybe the Brazilian one if Francy Hereira was in a position to pull strings for me, into taking me aboard for a while until a ship showed up. Or I might not.

Considered carefully, the chances were not very hopeful.

The very best thing I could do would be to act before the Board did, and there there were two choices.

I could take the next ship in port back to Earth and the food mines, without waiting for the Board's decision.

Or I could ship out again.

They were two lovely choices. One of them meant giving up every chance of a decent life forever . . . and the other one scared me out of my mind.

* * *

Gateway was like a gentlemen's club in which you never knew what members were in town. Louise Forehand was gone; her husband, Sess, was patiently holding the fort, waiting for her or their remaining daughter to return before shipping out again himself. He helped me move back into my room, which had been temporarily occupied by three Hungarian women until they had shipped out together in a Three. Moving took no great effort; I didn't own anything any more, except what I had just bought in the commissary.

The only permanent feature was Shicky Bakin, unfailingly friendly and always there. I asked him if he had heard from Klara. He had not. "Go out again, Bob," he urged. "It is the only thing to do."

"Yeah." I did not want to argue it, he was incontestably right. Maybe I would . . . . I said, "I wish I weren't a coward, Shicky,

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but I am. I just don't know how I can make myself get into a ship again. I don't have the courage to face a hundred days of fearing death every minute."

He chuckled, and hopped off the chest of drawers to pat my shoulder. "You don't need so much courage," he said, flapping back to the chest. "You only need courage for one day: just to get in the ship and go. Then you don't have to have courage any more, because you don't anymore have a choice."

"I think I could have done it," I said, "if Metchnikov's theories about the color-codes had been right. But some of the safe ones are dead."

"It was only a statistical matter, Bob. It is true that there is a better safety record now, and a better success record too. Only marginal, yes. But better."

"The ones that died are just as dead," I said. "Still—perhaps I'll talk to Dane again."

Shicky looked surprised. "He's out."

"When?"

"Around when you left. I thought you knew."

I had forgotten. "Wonder if he found the soft touch he was looking for."

Shicky scratched his chin with his shoulder, keeping himself balanced with lazy wing strokes. Then he hopped off the chest and fluttered over the piezophone. "Let's see," he said, and punched buttons. The locator board jumped into view on the screen. "Launch 88-173," he read. "Bonus, $150,000. That's not much, is it?"

"I thought he was going for something bigger."

"Well," said Shicky, reading on, "he didn't get it. Says here he came back last night."

Since Metchnikov had halfway promised to share his expertise with me, it made sense for me to talk to him; but I wasn't feeling sensible. I got as far as checking out that he had returned without a find and with nothing to show for his efforts but the bonus; but I didn't go to see him.

I didn't do much of anything, in fact. I hung around.

Gateway is not the most amenity-filled place to live in the universe, but I found things to do. It beat the food mines. Each passing hour brought me an hour closer to the time when the xenotech's report would arrive, but I managed not to think about that most of the time. I nursed drinks in the Blue Hell, making friends with the tourists, the visiting cruiser crews, the returnees, the new fish that kept coming up from the sweltering planets, looking, I guess, for another Klara. None showed up.

I read over the letters I had written her on the trip back from Gateway Two, and then I tore them up. Instead I wrote a simple short note to apologize and tell her that I loved her and took it down to radio it off to her on Venus. But she wasn't there! I had forgotten how long the slow Hohmann orbits took. The locator office identified the ship she had left on easily enough; it was a right-angle orbiter, that spent its whole life changing deltas to rendezvous with plane-of-the-ecliptic flights between the planets. According to the records her ship had

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Classifieds.

AREN'T THERE any English-speaking non-smokers on Gateway to fill out our crew? Maybe you want to shorten your life (and our life-support reserves!) but we two don't. 88-775.

WE DEMAND prospector representation on Gateway Corporation Board! Mass meeting tomorrow 1300 Level Babe. Everyone welcome!

SELECT FLIGHTS tested, whole-person way from your dreams. 32-page sealed book tells how, $10. Consultations, $25. 88-139.

made a rendezvous with a Mars-bound freighter, and then a Venus-bound high-G luxury liner; she had presumably transferred to one of them, but they didn't know which, and neither one of them would reach its destination for a month or more yet.

I sent duplicate copies to each ship, but there wasn't any answer.

The closest I came to a new girl friend was a Gunner Third from the Brazilian cruiser. Francy Hereira brought her around. "My cousin," he said, introducing us; and then, privately, later, "You should know, Rob, that I do not have family feelings about my cousins." All the crews got shore leave on Gateway from time to time, and while, as I have said, Gateway wasn't Waikiki or Cannes, it beat the bare bones of a combat vessel. Susie Hereira was very young. She said she was nineteen, and was supposed to be at least seventeen to be in the Brazilian navy at all, but she didn't look it. She did not speak much English, but we did not need much language in common to drink at the Blue Hell; and when we went to bed we discovered that although we had very little conversation in a verbal sense we communicated beautifully with our bodies.

But Susie was only there one day a week, and that left a great deal of time which needed destroying.

I tried everything: a reinforcement group, group-hugging and working out loves and hostilities on each other. Old Hegramet's lecture series on the Heechee. A program of talks on astrophysics, with a slant toward earning science bonuses from the Corporation. By careful budgeting of my time I managed to use it all up, and decision was postponed day by day.

I do not want to give the impression that destroying time was a conscious plan in my mind; I was living from day to day, and each day was full. On a Thursday Susie and Francy Hereira would check in, and the three of us might have lunch at the Blue Hell. Then Francy would go off to roam by himself, or pick up a girl, or take a swim in Lake Superior, while Susie and I would retire to my room and my dope sticks to swim on those warmer waters of my bed. After dinner, some sort of entertainment. Thursday was the night the astrophysics lectures took place, and we would hear about the Hertzsprung-Russell diagram, or red giants and dwarfs, or neutron stars, or black holes. The professor was a fat old-girl-grabber from some jerkwater college near Smolinsk, but even through the

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dirty jokes there was poetry and beauty in what he talked about. He dwelt on the old stars that gave birth to us all, spitting silicates and magnesium carbonate into space to form our planets, hydrocrabons to form ourselves. He talked about the neutron stars that bent the gravity well around them; we knew about them, because two launches had killed themselves, sheared into rubble, by entering normal space too close to one of those hyper-dense dwarfs. He told us about the black holes that were the places where a dense star had been, now detectable only by the observable fact that they swallowed everything nearby, even light; they had not merely bent the gravity well, they had wrapped it around themselves like a blanket. He described stars as thin as air, immense clouds of glowing gas; told us about the pre-stars of the Orion Nebula, just now blossoming into loose knots of warm gas that might in a million years be suns. His lectures were very popular; even old hands like Shicky and Dane Metchnikov showed up. While I listened to the professor I could feel the wonder and beauty of space. It was too immense and glorious to be frightening, and it was not until later that I would relate those sinks of radiation and swamps of thin gas to *me*, to the frail, frightened, pain-sensitive creation that was the body I inhabited. And then I would think about going out among those remote titans and . . . my soul curled up inside me.

After one of those meetings I said good-by to Susie and Francy and sat in an alcove near the lecture room, half hidden by the ivy, and despondently smoked a joint. Shicky found me there, and halted just in front of me, supporting himself on his wings. "I was looking for you, Bob," he said, and stopped.

The grass was just beginning to hit me. "Interesting lecture," I said absently, reaching for the good feeling that I wanted from the joint and not really very interested in whether Shicky was there or not.

"You missed the most interesting part," said Shicky.

It occurred to me that he was looking both fearful and hopeful; there was something on his mind. I took another hit, and offered him the joint; he shook his head. "Bob," he said, "I think there is something worth having coming up."

"Really?"

"Yes, really, Bob! Something quite good. And soon."

I was not ready for this, I wanted to go on smoking my joint until the temporary thrill of the lecture had worn off, so that I could go back to destroying the days. The last thing I wanted was to hear about some new mission that my guilt would make me want to sign on for, and my fear would abort.

Shicky caught the shelf of ivy and held himself up by it, looking at me curiously. "Bob-friend," he said, "if I can find something out for you, will you help me?"

"Help you how?"

"Take me with you!" he cried. "I can do everthing but go in the lander. And this mission, I think, is one where it does not so much matter. There is a bonus for everyone, even for someone who must remain

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Mission Report

Vessel A3-77, Voyage 036D51. Crew T. Parreno, N. Ahoya, E. Nimkin.

Transit time 5 days 14 hours. Position-vicinity Alpha Centauri A.

Summary. "The planet was quite earthlike and heavily vegetated. The color of the vegetation was predominantly yellow. The atmosphere matched the Heechee mix closely. It is a warm planet with no polar ice caps and a temperature range similar to Earth tropics at the equator, Earth temperate extending almost to the poles. We detected no animal life or signatures (methane, etc.) thereof. Some of the vegetation predates at a very slow pace, advancing by uprooting portions of a vinelike structure, curling around and rerooting. Maximum velocity measured was approximately 2 kilometer per hour.

No artifacts. Parrena and Nimkin landed and returned with samples of vegetation, but died of a toxicodendron-like reaction. Great blisters formed over their bodies. Then they developed pain, itching and apparent suffocation, probably due to fluids accumulating in the lungs. I did not bring them aboard the vessel. I did not open the lander, or dock it to the vessel. I recorded personal messages for both, then jettisoned the lander and returned without it."

Corporation assessment: No charge made against N. Ahoya in view of past record.

---

in orbit."

"What are you talking about, Shicky?"

The grass was hitting me now; I could feel the warmth behind my knees and the gentle blur all around me.

"Metchnikov was talking to the lecturer," Shicky said. "I think from what he said that he knows of a new mission. Only—they spoke in Russian, and I did not understand very well. But it is the one he has been waiting for."

I said reasonably, "The last one he went out on wasn't much, was it?"

"This is different!"

"I don't think he would really cut me in on anything good—"

"Certainly not, if you don't ask."

"Oh, hell," I grumbled. "All right. I'll talk to him."

Shicky beamed. "And then, Bob, please—take me with you?"

I stubbed out the joint, less than half smoked; I felt as though I wanted what was left of my wits about me. "I'll do what I can," I said, and headed back for the lecture room just as Metchnikov was coming out.

We had not spoken since he had returned. He looked as solid and broad as ever, and his fringe of chin-whiskers was neatly trimmed. "Hello, Broadhead," he said suspiciously.

I didn't waste words. "I hear you've got something good coming up. Can I go along?"

He didn't waste words, either. "No."

He looked at me with frank dislike. Partly that was what I had expected from him all along, but I was pretty sure part of it was because he had heard about me and Klara.

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"You are going out," I persisted. "What is it, a One?"

He stroked his whiskers. "No," he said reluctantly, "it isn't a One. It's two Fives."

"*Two* Fives?"

He stared at me suspiciously for a moment, and then almost grinned; I did not like him when he smiled, it was always a question in my mind what he was smiling about.

"All right," he said. "You want in, you can have it, for all of me. It's not up to me, of course. You'll have to ask Emma; she's doing a briefing tomorrow morning. But she might let you go. It's a science mission, with a minimum million-dollar bonus. And you're involved."

"I'm involved?" That was something out of an unexpected direction! "Involved how?"

"Ask Emma," he said, and brushed past me.

* * *

There were about a dozen prospectors in the briefing room, most of whom I knew: Sess Forehand, Shicky, Metchnikov and a few others I'd drunk with or gone to bed with, one time or another. Emma wasn't there yet, and I managed to intercept her as she was coming in.

"I want to go out on this mission," I said.

She looked startled. "You do? I thought—" But she stopped there, without saying what it was she thought. I followed up:

"I have as much right to go as Metchnikov does!"

"You sure as hell don't have as good a record as he does, Bob." She looked me over carefully, and then she said, "Well, I'll tell you how it is, Broadhead. It's a special mission, and partly you're responsible for it. That boner of yours turns out to be interesting. I don't mean wrecking the ship; that was stupid, and if there was any justice in the universe you'd pay for it. But dumb luck is almost as good as brains."

"You got the report from Gateway Two," I guessed.

She shook her head. "Not yet. But it doesn't matter. We routinely programmed your mission into the computer, and it found some interesting correlations. The course pattern that took you to Gateway Two—Oh, hell," she said, "come on inside. You can sit through the briefing, at least. It'll explain everything, and then—we'll see."

She took my elbow and pushed me ahead of her into the room, which was the same one we had used for a classroom—how long before? It seemed like a million years. I sat down between Sess and Shicky, and waited to hear what it was she had to say.

"Most of you," she started off, "are here by invitation—with one or two exceptions. One of the exceptions is our distinguished friend Mr. Broadhead. He managed to wreck a ship near Gateway Two, as most of you know. By rights we ought to throw the book at him, but before he did that he accidentally turned up some interesting facts. His course colors were not the regular ones for Gateway Two, and when the computer compared them it came up with a whole new concept of course setting. Apparently only about five settings are critical for destination—the five that were

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the same for the usual Gateway Two setting, and for Broadhead's new one. What the other settings mean we don't know. But we're going to find out."

She leaned back and folded her hands. "This is a multiple-purpose mission," she said. "We're going to do something new. For openers, we're going to send two ships to the same destination."

Sess Forehand raised his hand. "What's the point of that?"

"Well, partly to make sure it *is* the same destination. We're going to vary the non-critical settings slightly . . . the ones we *think* are non-critical. And we're going to start the two ships only a few seconds apart.

"Now, if we know what we're doing, that means you'll come out about as far apart as Gateway travels in thirty seconds."

Forehand wrinkled his brow. "Relative to what?"

"Good question," she nodded. Relative, we think, to the Sun. The stellar motion relative to the Galaxy—we think—can be neglected. At least, assuming that your destination turns out to be inside the Galaxy, and not so far away that the galactic motion has a markedly different vector. I mean, if you came out on the opposite side, it would be seventy kilometers a second, relative to the galactic center. We don't think that's involved. We only expect a relatively minor difference in velocity and direction, and—well, anyway, you should come out within somewhere between two and two hundred kilometers of each other.

"Of course," she said, smiling cheerfully, "that's only theoretical. Maybe the relative motions won't mean anything at all. In that case, the problem is to keep you from colliding with each other. But we're sure—pretty sure—that there will be at least some displacement. All you really need is about fifteen meters—the long diameter of a Five."

"How sure is pretty sure?" one of the girls asked.

"Well," Emma admitted, "reasonably sure. How do we know until we try?"

"It sounds dangerous," Sess commented. He did not seem deter-

A NOTE ON SIGNATURES

Dr. Asmenion. So when you're looking for signs of life on a planet, you don't expect a big neon sign that says "Aliens Live Here". You look for signatures. A "signature" is something that shows something else is there. Like your signature on a check. If I see that, I know it shows that you want it paid, so I cash it. Not yours, of course, Bob.

Question. God hates a smart-assed teacher.

Dr. Asmenion. No offense, Bob. Methane is a typical signature. It shows the presence of warm-blooded mammals, or something like them.

Question. I thought methane could come from rotting vegetation and all that?

Dr. Asmenion. Oh, sure. But mostly it comes from the guts of large ruminants. Most of the methane in the Earth's air is cow farts.

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red by it. He was only stating an opinion. In this he was unlike me; I was very busy ignoring my inner sensations, trying to concentrate on the technicalities of the briefing.

Emma looked surprised. "That part? Look, I haven't come to the dangerous part yet. This is a non-accept destination for all Ones, most Threes and some Fives."

"Why?" someone asked.

"That's what you're going there to find out," she said patiently. "It happens to be the setting the computer picked out as best for testing the correlations between course settings. You've got armored Fives, and both accept this particular destination. That means you have what the Heechee designers figured was a good chance to handle it, right?"

"That was a long time ago," I objected.

"Oh, sure. I never said otherwise. It *is* dangerous—at least to some extent. That's what the million is for."

She stopped, gravely considering us, until someone obliged by asking, "What million?"

"The million-dollar bonus each one of you gets when you come back," she said. "They've appropriated ten million dollars out of Corporation funds for this. Equal shares. Of course, there's a good chance that it will be more than a million each. If you find anything worth while, the regular pay scales apply. And the computer thinks this is a good prospect."

"Why is it worth ten million?" I asked.

"I don't make these decisions," she said patiently. And then she looked at me as a person, not part of the group, and added, "And by the way, Broadhead. We're writing off your damage to the ship. So what ever you get is yours to keep. A million dollars? That's a nice little nest-egg. You can go back home, buy yourself a little business, live the rest of your life on that."

We looked at each other, and Emma just sat there, smiling gently and waiting. I don't know what the others were thinking about. What I was remembering was Gateway Two and the first trip, wearing our eyes out at the instruments, looking for something that wasn't there. I suppose each of the others had washouts of their own to remember.

"Launch," she said at last, "is day after tomorrow. The ones who want to sign, come see me in my office."

They accepted me. They turned Shicky down.

But it wasn't as easy as that, nothing ever is; the one who made sure Shicky was not going to go along was me. They filled up the first ship quickly: Sess Forehand, two girls from Sierra Leone and a French couple—all English-speaking, all briefed, all with previous missions. For the second ship Metchnikov signed as crew chief right away; a gay couple Danny A. and Danny R., were his first picks. Then, grudgingly, he agreed to me. And that left one opening.

"We can take your friend Bakin," Emma said. "Or would you prefer your other friend?"

"What other friend?" I demanded.

"We have an application," she said, "from Gunner Third Suzanna

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Dear Voice of Gateway:

Last month I spent ¢58.50 of my hard-earned money to take my wife and son to a ""lecture'' by one of your returned ""heroes'' who gave Liverpool the dubious honour of a visit (for which he was well paid, naturally, by people like me.) I didn't mind that he was not a very interesting speaker. It was what he flaming well said that drove me right up the flaming wall. He said we poor sods of earthlings had just no idea of how dicey things were for you noble adventurers.

Well, mate, this morning I drew out the last pound in the savings account so the wife could get a lung patch (good old melanomic asbestosis CVE, you know). The kid's tuition comes due in a week and I haven't a clue where it's coming from. And after spending eight-to-twelve this morning waiting by the docks for a chance to shift some cargo (there wasn't any) the foreman let me know I was redundant, which means tomorrow I don't even have to bother to show up to wait. Any of you heroes care to pick up a bargain in surplus parts? Mine are for sale, kidneys, liver, the lot. All in good condtion, too, or as good as nineteen years on the docks can be expected to leave them, except for the tear glands of the eyes, which are fair wore out with weeping over the troubles of you lot.

H. Delacross
""Wavetops''
Flat B bis 17, 41st Floor
Merseyside L77PR 14JE6

Hereira, off the Brazilian cruiser. She has their permission to take leave for this purpose."

"Susie! I didn't know she'd volunteered!"

Emma studied her punch card reflectively. "She's very well qualified," she commented. "Also she has all her parts. I am referring," she said sweetly, "to her legs, of course, although as I understand it you have some interest in her other parts as well. Or would you care to go gay for this mission?"

I felt an unreasoning rush of anger. I am not one of your sexually up-tight people; the thought of physical contact with a male was not frightening in itself. But—with Dane Metchnikov? Or one of his lovers?

"Gunner Hereira can be here tomorrow," Emma commented. "The Brazilian cruiser is going to dock right after the orbiter."

"Why the hell are you asking me?" I snarled. "Metchnikov's crew chief."

"He prefers to leave it to you, Broadhead. Which one?"

"I don't give a damn!" I yelled, and left.

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But there is no such thing as avoiding a decision. Not making a decision was in itself decision enough to keep Shicky off the crew. If I had fought for him, they would have taken him; without that, Susie was the obvious choice.

I spent the next day staying out of Shicky's way. I picked up a new fish at the Blue Hell, fresh out of the classroom, and spent the night in her room. I didn't even go back to my own room for fresh clothes; I dumped everything and bought a new outfit. I knew pretty well the places where Shicky might look for me—the Blue Hell, Central Park, the museum—and so I stayed away from all those places; I went for a long, rambling wander through the deserted tunnels, seeing no one at all, until late that night.

Then I took a chance and went to our farewell party. Shicky would probably be there, but there would be other people around.

He was. And so was Louise Forehand. In fact, she seemed to be the center of attention; I hadn't even known she was back.

She saw me and waved to me. "I struck it rich, Bob! Drink up—I'm buying!"

I let someone put a glass in one hand and a joint in the other, and before I took my hit I managed to ask her what she'd found.

"Weapons, Bob! Marvelous Heechee weapons, hundreds of them. Sess says it's going to be at least a five-million-dollar award. *Plus* royalties . . . if anyone finds a way to duplicate the weapons, anyway."

I let the smoke blow out and washed out the taste with a swallow of white lightning. "What kind of weapons?"

"They're like the tunnel diggers, only portable. They'll cut a hole through anything. We lost Sara alaFanta in the landing; one of them put a hole in her suit. But Tim and I are whacking up her share, so it's two and a half mill apiece."

"Congratulations," I said. "I would have thought the last thing the human race needed was some new ways to kill each other, but—congratulations." I was reaching for an air of moral superiority, and I needed it; because as I turned away, there was Shicky, hanging in air, watching me.

"Want a hit?" I asked, offering him the joint.

He shook his head.

I said, "Shicky, it wasn't up to me. I told them—I didn't tell them not to take you."

"Did you tell them they should?"

"It wasn't up to me," I said. "Hey, listen!" I went on, suddenly seeing an out. "Now that Louise has hit, Sess probably won't want to go. Why don't you take his place?"

He backed away, watching me; only his expression had changed. "You don't know?" he asked. "It is true that Sess has canceled out of the mission, but he has already been replaced."

"By whom?"

"By the person right behind you," said Shicky, and I turned around, and there she was, looking at me, a glass in her hand and an expression I could not read on her face.

"Hello, Bob," said Klara.

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Mission Report

Vessel 3-184, Voyage 019D140. Crew S. Kotsis, A. McCarthy, K. Metsuoko.

Transit time out 615 days 9 hours. No crew reports from destination. Spherical scan data inconclusive as to destination. No identifiable features.

No summary.

Extract from log. "This is the 281st day out. Metsuoko lost the draw and suicided. Alicia voluntarily suicided 40 days later. We haven't yet reached turnaround, so it's all for nothing. The remaining rations are not going to be enough to support me, even if you include Alicia and Kenny, who are intact in the freezer. So I am putting everything on full automatic and taking the pills. We have all left letters. Please forward them as addressed, if this God-damned ship ever gets back."

Mission Plan filed proposal that a Five with double life-support rations and a one-person crew might be able to complete this mission and return successfully. Proposal tabled on grounds of low priority: No evident benefit from repeating this mission.

* * *

I had prepared myself for the party by a number of quick ones in the commissary; I was ninety per cent drunk and ten per cent stoned, but it all whooshed out of me as I looked at her. I put down the drink, handed the joint to someone at random, took her arm and pulled her out into the tunnel.

"Klara," I said, "Did you get my letters?"

She looked puzzled. "Letters?" She shook her head. "I guess you sent them to Venus? I never got there. I got as far as rendezvous with the plane-of-the-ecliptic flight, and then I changed my mind. I came right back on the orbiter."

"Oh, Klara."

"Oh, Bob," she mimicked, grinning; that wasn't much fun, because when she smiled I could see where the tooth was missing that I had knocked out. "So what else have we got to say to each other?"

I put my arms around her. "I can say that I love you, and I'm sorry, and I want to make it up to you, and I want to get married and live together and have kids and—"

"Jesus, Bob," she said, pushing me away, gently enough, "when you say something you say a lot, don't you? So hold it for a while. It'll keep."

"But it's been *months*!"

She laughed. "No fooling, Bob. This is a bad day for Sagittarians to make decisions, especially about love. We'll talk about it another time."

"That crap! Listen, I don't believe in any of that!"

"I do, Bob."

I had an inspiration. "Hey! I bet I can trade with somebody in the first ship! Or, wait a minute, maybe Susie would trade with you—"

She shook her head, still smiling. "I really don't think Susie would like that," she said. "Anyway, they bitched enough about letting me switch with Sess. They'll never stand still for another last-minute change."

"I don't care, Klara!"

"Bob," she said, "don't rush me. I did a lot of thinking about

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you and me. I think we've got something that's worth working for. But I can't say it's all straight in my head yet, and I don't want to push it."

"But, Klara—"

"Leave it at that, Bob. I'll go in the first ship, you go in the second. When we get where we're going we'll be able to talk. Maybe even switch around to come back together. But meanwhile we'll both have a chance to think about what we really want."

The only words I seemed to know I seemed to be saying over and over again: "But, Klara—"

She kissed me, and pushed me away. "Bob," she said, "don't be in such a hurry. We've got all the time there is."

XXVII

"Tell me something, Sigfrid," I say, "how nervous am I?"

He is wearing his Sigmund Freud hologram this time, truculent Viennese stare, not a bit gemütlich. But his voice is the same gently sad baritone: "If you are asking what my sensors show, Bob, you are quite agitated, yes."

"I thought so," I say, bouncing around the mat.

"Can you tell me why?"

"No!" The whole week has been like that, marvelous sex with Doreen and S. Ya., and floods of tears in the shower; fantastic bidding and play at the bridge tournament, and total despair on the way home. I feel like a yo-yo. "I feel like a yo-yo," I yell. "You've opened up something I can't handle."

"I think you underestimate your capacity for handling pain," he says reassuringly.

"Fuck you, Sigfrid! What do you know about human capacity?"

He almost sighs. "Are we back to that again, Bob?"

"We bloody well are!" And funnily, I feel less nervous; I've got him into an argument again, and the peril is reduced.

"It is true, Bob, that I am a machine. But I am a machine designed to understand what humans are like and, believe me, I am well designed for my function."

"Designed! Sigfrid," I say reasonably, "you *aren't* human. You may *know*, but you don't *feel*. You have no idea what it feels like to have to make human decisions and carry the load of human emotion. You don't know what it feels like to have to tie up a friend to keep him from killing. To have someone you love die. To know it's your fault.

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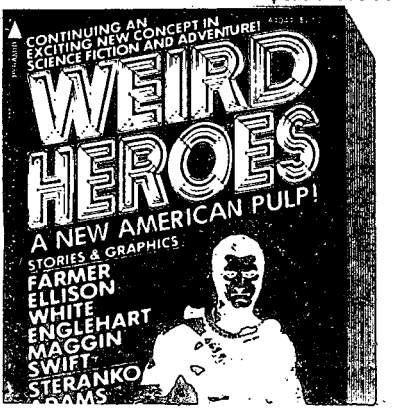

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To be scared out of your mind."

"I do know those things, Bob," he says gently. "I really do. I want to explore why you are feeling so turbulent, so won't you please help me?"

"No!"

"But your agitation, Bob, means that we are approaching the central pain—"

"Get your bloody drill out of my nerve!" But the analogy doesn't throw him for a second; his circuits are finely tuned that day.

"I'm not your dentist, Bob, I'm your analyst, and I tell you—"

"Stop!" I know what I have to do to get him away from where it hurts. I haven't used S. Ya.'s secret little formula since that first day, but now I want to use it again. I say the words, and convert him from a tiger to a pussycat; he rolls over and lets me stroke his tummy, as I command him to display the gaudier bits from some of his interviews with attractive and highly quirky female patients; and the rest of the hour is spent as a peepshow; and I have got out of his room one more time intact.

Or nearly.

XXVIII

Out in the holes where the Heechee hid, out in the caves of the stars, sliding the tunnels they slashed and slid, healing the Heechee-hacked scars . . . Jesus, it was like a Boy Scout campout; we sang and frolicked all the nineteen days after turnaround. I don't think I ever felt that good in my life. Partly it was release from fear; when we hit turnaround we all breathed easier, as you always do. Partly it was that the first half of the trip had been pretty gritty, with Metchnikov and his two boy friends in a complicated triple spat most of the time and Susie Hereira a lot less interested in me on shipboard than she had been as a once-a-week night out on Gateway. But mostly, I think, for me anyway, it was knowing that I was getting closer and closer to Klara. Danny A. helped me work out the figures; he'd taught some of the courses on Gateway, and he may have been wrong but there wasn't anybody around righter so I took his word for it: He calculated from the time of turnaround that we were going something like three hundred light-years in all—a guess, sure, but close enough. The first ship, the one Klara was in, was getting further and further ahead of us all the way to turnaround, at which point we were going something over ten light-years a day (or so Danny said). Klara's Five had been launched thirty seconds ahead of us, so then it was just arithmetic: About one light-day. $3x10^{10}$ centimeters per second times 60 seconds times 60 minutes times 24 hours . . . at turnaround Klara was a good seventeen and a half billion kilometers ahead of us. It seemed very far, and was. But after turnaround we were getting closer every day, following her in the same wormhole through space that the Heechee had drilled for us. Where my ship was going, hers had gone. I could feel that we were catching up; sometimes I fantasied that I could smell her perfume.

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Classifieds.

INTERESTS HARPSICHORD, Go, group sex. Seek four likeminded prospectors view toward teaming. Gerriman, 78-109.

TUNNEL SALE. Must sell holodisks, clothes, sex aids, books, everything. Level Baby, Tunnel Twelve, ask for DeVittorio, 1100 hours until it's all gone.

TENTH MAN needed for minyan for Abram R. Sorchuk, presumed dead, also ninth, eighth and seventh men. Please. 87-103.

When I said something like that to Danny A. he looked at me queerly. "Do you know how far seventeen and a half billion kilometers is? You could fit the whole solar system in between them and us. Just about exactly; the semi-major axis of Pluto's orbit is thirty-nine a.u. and change."

I laughed, a little embarrassed. "It was just a notion."

"So go to sleep," he said, "and have a nice dream about it." He knew how I felt about Klara; the whole ship did, even Metchnikov, even Susie, and maybe that was a fantasy too but I thought they all wished us well. We were all wishing all of us well, constructing elaborate plans about what we were going to do with our bonuses. For Klara and me, at a million dollars apiece, it came to a right nice piece of change. Maybe not enough for Full Medical, no, not if we wanted anything left over to have fun on. But Major Medical, at least, which meant really good health, barring something terribly damaging, for another thirty or forty years. We could live happily ever after on what was left over: travel. Children! A nice home in a decent part of—wait a minute, I cautioned myself, a home where? Not back anywhere near the food mines. Maybe not on Earth at all. Would Klara want to go back to Venus? I couldn't see myself taking to the life of a tunnel rat. But I couldn't see Klara in Dallas or New York, either. Of course, I thought, wish racing far ahead of reality, if we really *found* anything the lousy million apiece might be only the beginning. Then we could have all the homes we wanted, anywhere we liked; and Full Medical, too, with transplants to keep us young and healthy and beautiful and sexually strong and—

"You really ought to go to sleep," said Danny A. from the sling next to mine; "the way you thrash around is a caution."

But I didn't feel like going to sleep. I was hungry, and there wasn't any reason not to eat. For nineteen days we had been practicing food discipline, which is what you do on the way out for the first half of the trip. Once you've reached turnaround you know how much you can consume for the rest of the trip, which is why some prospectors come back fat. I climbed down out of the lander, where Susie and both the Dannys were sacked in, and then I found out what it was that was making me hungry. Dane Metchnikov was cooking himself a stew.

"Is there enough for two?"

He looked at me thoughtfully. "I

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A NOTE ON PIEZOELECTRICITY

Prof. Hegramet. The one thing we found out about blood diamonds is that they're fantastically piezoelectric. Does anybody know what that means?

Question. They expand and contract when an electric current is imposed.?

Prof. Hegramet. Yes. And the other way around. Squeeze them and they generate a current. Very rapidly if you like. That's the basis for the piezophone and piezovision. About a fifty billion dollar industry.

Question. Who gets the royalties on all that loot?

Prof. Hegramet. You know, I thought one of you would ask that. Nobody does. Blood diamonds were found years and years ago, in the Heechee warrens back on Venus. Long before Gateway. It was Bell Labs that figured out how to use them. Actually they use something a little different, a synthetic they developed. They make great communications systems, and Bell doesn't have to pay anybody but themselves.

Question. Did the Heechee use them for that?

Prof. Hegramet. My personal opinion is that they probably did, but I don't know how. You'd think if they left them around they'd leave the rest of the communications receivers and transmitters too, but if they did I don't know where.

---

guess so." He opened the squeeze-fit lid, peered inside, milked another hundred cc of water into it out of the vapor trap and said, "Give it another ten minutes. I was going to have a drink first."

I accepted the invitation, and we passed a wine-flask back and forth. While he shook the stew and added a dollop of salt I took the star readings for him. We were still close to maximum velocity and there was nothing on the viewscreen that looked like a familiar constellation, or even much like a star; but it was all beginning to look friendly and good to me. To all of us. I'd never seen Dane so cheerful and relaxed. "I've been thinking," he said. "A million's enough. After this one I'm going back to Syracuse, get my doctor's, get a job. There's going to be some school somewhere that'll want a poet in residence or an English teacher who's been on seven missions. They'll pay me something, and the money from this will keep me in extras all the rest of my life."

All I had really heard was the one word, and that I had heard loud and surprising: "Poet?"

He grinned. "Didn't you know? That's how I got to Gateway; the Guggenheim Foundation paid my way." He took the pot out of the cooker and divided the stew into two dishes, and we ate.

This was the fellow who had been shrieking viciously at the two Dannys for a solid hour, two days before, while Susie and I lay angry and isolated in the lander, listening. It was all turnaround. We were home free; the mission wasn't going to strand us out of fuel, and we didn't have to worry about finding anything, because our reward was

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guaranteed. I asked him about his poetry. He wouldn't recite any, but promised to show me copies of what he'd sent back to the Guggenheims when we reached Gateway again.

And when we'd finished eating, and wiped out the pot and dishes and put them away, Dane looked at his watch. "Too early to wake the others up," he said, "and not a damn thing to do."

He looked at me, smiling. It was a real smile, not a grin; and I pushed myself over to him, and sat in the warm and welcome circle of his arm.

* * *

And nineteen days went like an hour, and then the clock told us it was almost time to arrive. We were all awake, crowded into the capsule, eager as kids at Christmas, waiting to open our toys. It had been the happiest trip *I* had ever made, and probably one of the happiest ever. "'You know," said Danny R. thoughtfully, "I'm almost sorry to arrive." And Susie, just beginning to understand our English, said:

"*Sim, ja sei,*" and then, "I *too*!" She squeezed my hand, and I squeezed back; but what I was really thinking about was Klara. We had tried the radio a couple of times, but it didn't work in the Heechee wormholes through space. But when we came out I would be able to talk to her! I didn't mind that others would be listening, I knew what it was that I wanted to say. I even knew what she would answer. There was no question about it; there was surely as much euphoria in her ship as in ours, for the same reasons, and with all that love and joy the answer was not in doubt.

"We're stopping!" Danny R. yelled. "Can you feel it?"

"Yes!" crowed Metchnikov, bouncing with the tiny surges of the pseudo-gravity that marked our return to normal space. And there was another sign, too: the golden helix was beginning to glow, brighter every second.

"I think we've made it," said Danny R., bursting with pleasure, and I was as pleased as he.

"I'll start the spherical scan," I said, confident that I knew what to do. Susie took her cue from me and opened the door up to the lander; she and Danny A. were going to go out for the star sights.

But Danny A. didn't join her. He was staring at the viewscreen. As I started the ship turning I could see stars, which was normal enough; they did not seem special in any way, although they were rather blurry for some reason.

I staggered and almost fell. The ship's rotation did not seem as smooth as it should be.

"The radio," Danny said, and Methnikov, frowning, looked up and saw the light.

"Turn it on," I cried. The voice I heard might be Klara's. Metchnikov, still frowning, reached for the switch, and then I noticed that the helix was a brighter gold than I had ever seen it, straw-colored, as though it were incandescently hot. No heat came from it, but the golden color was shot through with streaks of pure white.

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"That's funny," I said, pointing.

I don't know if anyone heard me; the radio was pouring out static, and inside the capsule the sound was very loud. Metchnikov grabbed for the tuning and the gain.

Over the static I heard a voice I didn't recognize at first, but it was Danny A's. "Do you feel that?" he yelled. "It's gravity waves. We're in trouble. Stop the scan!"

I stopped it reflexively.

But by then the ship's screen had turned and something was in view that was not a star and not a galaxy. It was a dimly glowing mass of pale blue light, mottled, immense and terrifying. Even at the first glimpse I knew it was not a sun. No sun can be so blue and so dim. It hurt the eyes to look at it, not because of its brightness. It hurt inside the eyes, up far into the optic track; the pain was in the brain itself.

Metchnikov switched off the radio, and in the silence that followed I heard Danny A. say prayerfully, "Dearest God! We've had it. That thing is a black hole."

XXIX

"With your permission, Bob," says Sigfrid, "I'd like to explore something with you before you command me into my passive display mode."

I tighten up, the son of a bitch has read my mind. "I observe," he says instantly, "that you are feeling some apprehension. That's what I would like to explore."

Incredibly, I feel myself trying to save his feelings. Sometimes I forget he's a machine. "I didn't know you were aware that I've been doing that," I apologize.

NavInstGdSup 104

Please supplement your Navigation Instruction Guide as follows:

Course settings containing the lines and colors as shown in the attached chart appear to have a definite relation to the amount of fuel or other propulsion necessity remaining for use by the vessel.

All prospectors are cautioned that the three bright lines in the orange (Chart 2) appear to indicate extreme shortage. No vessel displaying them in its course has ever returned, even from check flights.

"Of course I'm aware, Bob. When you have given me the proper command I obey it, but you have not ever given me the command to refrain from recording and integrating data. I assume you do not possess that command."

"You assume good, Sigfrid."

"There is no reason that you should not have access to whatever information I possess. I have not attempted to interfere until now—"

"Could you?"

"I do have the capacity to signal the use of the command instruction to higher authority, yes. I have not done that."

"Why not?" The old bag of bolts keeps on surprising me; all this is new to me.

"As I have said, there is no reason to. But clearly you are attempting to postpone some sort of confrontation, and I would like to tell you what I think that confrontation involves. Then you can make your own decision."

"Oh, cripes." I throw off the straps and sit up. "Do you mind if

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I smoke?" I know what the answer is going to be, but he surprises me again.

"Under the circumstances, no. If you feel the need of a tension reducer I agree. I had even considered offering you a mild tranquilizer if you wish it."

"Jesus," I said admiringly, lighting up—and I actually have to stop myself from offering him one! "All right, let's have it."

Sigfrid gets up, stretches his legs and crosses to a more comfortable chair! I hadn't known he could do that either. "I am trying to put you at your ease, Bob," he says, "as I am sure you observe. First let me tell you something about my capacities—and yours—which I do not think you know. I can provide information about any of my clients. That is, you are not limited to those who have had access to this particular terminal."

"I don't think I understand that," I say, after he pauses.

"I think you do. Or will. When you want to. However, the more important question is what memory you are attempting to keep suppressed. I feel it is necessary for you to unblock it. I had considered offering you light hypnosis, or a tranquilizer, or even a fully human analyst to come in for one session, and any or all of those are at your disposal if you wish them. But I have observed that you are relatively comfortable in discussions about what you perceive as objective reality, as distinguished from your internalization of reality. So I would like to explore a particular incident with you in those terms."

I carefully tap some ash off the end of my cigarette. He's right about that; as long as we keep the conversation abstract and impersonal I can talk about any bloody-thing. "What incident is that, Sigfrid?"

"Your final prospecting voyage from Gateway, Bob. Let me refresh your memory—"

"Jesus, Sigfrid!"

"I know you think you recall it perfectly," he says, interpreting me exactly, "and in that sense I don't suppose your memory needs refreshing. But what is interesting about that particular episode is that all the main areas of your internal concern seem to converge there. Your terror. Your homosexual tendencies"

"Hey!"

"—which are not, to be sure, a major part of your sexuality, Bob, but which give you more concern than is warranted. Your feelings about your mother. The immense burden of guilt you lay on yourself. And, above all, the woman Gelle-Klara Moynlin. All these things recur over and over in your dreams, Bob, although you often do not make the identification. And they are all present in this one episode."

I stub out a cigarette, and realize that I have had two going at once. "I don't see the part about my mother," I say at last.

"You don't?" The hologram that I call Sigfrid von Shrink turns toward a corner of the room. "Let me show you a picture." He raises his hand—that's pure theater, I know it is—and in the corner there appears a woman's figure. It is not very clear, but it is young, slim and is in the act of covering a cough.

"It's not a very good resem-

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blance to my mother," I object.

"Isn't it?"

"Well," I say generously, "I suppose it's the best you can do. I mean, not having anything to go on except, I guess, my description of her."

"The picture," says Sigfrid gently enough, "was assembled from your description of the girl Susie Hereira."

I light another cigarette, with some difficulty, because my hand is shaking. "Wow," I say, with real admiration. "I take my hat off to you, Sgifrid. That's very interesting. Of course," I go on, suddenly feeling irritable, "Susie was, my God, only a child! Apart from that I realize—I realize now, I mean—that there are some resemblances. But the age is all wrong."

"Bob," says Sigfrid, "how old was your mother when you were little?"

"She was very young." I add after a moment, "As a matter of fact, she looked a lot younger than she was even."

Sigfrid lets me hang there for a moment, and then he waves his hand again and the figure disappears, and instead we are suddenly looking at a picture of two Fives butted lander to lander in midspace, and beyond them is—is—

"Oh, my God, Sigfrid," I say.

He waits me out for a while.

As far as I am concerned, he can wait forever; I simply do not know what to say. I am not hurting, but I am paralyzed. I cannot say anything and I cannot move.

"This," he begins, speaking very softly and gently, "is a reconstruction of the two ships in your expedition in the vicinity of the object SAG YY. It is a black hole or, more accurately, a singularity in a state of extremely rapid rotation."

"I know what it is, Sigfrid."

"Yes. You do. Because of its rotation, the translation velocity of what is called its event threshhold or Schwarzchild discontinuity exceeds the speed of light, and so it is not properly black; in fact it can be seen by virtue of what is called Cerenkov radiation. It was because of the instrument readings on this and other aspects of the singularity that your expedition was awarded a ten million dollar bonus in addition to the agreed-upon sum which, along with certain other lesser amounts, is the foundation of your present fortune."

"I know that too, Sigfrid."

Pause.

"Would you care to tell me what else you know about it, Bob?"

Pause.

"I'm not sure I can, Sigfrid."

Pause again.

He isn't even urging me to try. He knows that he doesn't have to. I want to try, and I take my cue from his own manner. There is something in there that I can't talk about, that scares me even to think about; but wrapped around that central terror there is something I can talk about, and that is the objective reality.

"I don't know how much you know about singularities, Sigfrid."

"Perhaps you can just say what you think it is that I ought to know, Bob."

I put out the current cigarette and light another one. "Well," I say, "you know and I know that I really wanted to know about singularities

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it's all in the data banks somewhere; and a lot more exactly and informatively than I can say it, but anyway. The thing about black holes is they're traps. They bend light. They bend time. Once you're in you can't get out. Only—Only—"

After a moment Sigfrid says, "It's all right for you to cry if you want to, Bob," which is the way that I suddenly realize that that's what I'm doing.

"Jesus," I say, and blow my nose into one of the tissues that he always keeps handy right next to the mat. He waits.

"Only I did get out," I say.

And Sigfrid does something else I had never expected from him; he permits himself a joke. "That," he says, "is pretty obvious, from the fact that you're here."

"This is bloody exhausting, Sigfrid," I say.

"I am sure it is for you, Bob."

"I wish I had a drink."

Click. "The cabinet behind you," says Sigfrid, "that has just opened contains some rather good sherry. It isn't made from grapes, I'm sorry to say; the health service doesn't go in for luxuries. But I don't think you'll be aware of its natural-gas origins. Oh, and it is laced with just a dollop of THC to soothe the nerves."

"Holy Christ," I say, having run out of ways of expressing surprise. The sherry is all he says it is, and I can feel the warmth of it expanding inside me.

"Okay," I say, setting the glass down. "Well. When I got back to Gateway they'd written the expeditions off. We were almost a year

A NOTE ON NUTRITION

Question. What did the Heechee eat?

Prof. Hegramet. About what we do, I would say. Everything. I think they were omnivores, ate anything they could catch. We really don't know a thing about their diet, except that you can make some deductions from the shell missions.

Question. Shell missions?

Prof. Hegramet. There are at least four recorded missions that didn't go as far as another star, but went clear out of the solar system. Out where the shell of comets hangs out, you know, half a light-year or so away. They're marked as failures, but I don't think they are. I've been pushing the Board to give science bonuses for them. Three seemed to wind up in meteorite swarms. The other came out at a comet, all hundreds of A.U.'s out. Meteorite swarms, of course, are usually the debris of old, dead comets.

Question. Are you saying the Heechee ate comets?

Prof. Hegramet. Ate the things comets are made out of. Do you know what they are? Carbon, oxygen, nitrogen, hydrogen—the same elements you ate for breakfast. I think they used comets for feedstocks to manufacture what they ate. I think one of those missions to the cometary shell is sooner or later going to turn up a Heechee food factory, and then maybe we won't have anybody ever starving anywhere any more.

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overdue. Because we'd been *almost* inside the event horizon. Do you understand about time dilation? . . . Oh, never mind," I say, before he can answer, "that was a rhetorical queston. What I mean is, what happened was the phenomenon they call time dilation. You get that close to a singularity and you come up against the twin paradox. What was maybe a quarter of an hour for us was almost a year by clock time—clock time on Gateway, or here, or anywhere else in the non-relativistic universe, I mean. And—"

I take another drink, then I go on bravely enough:

"And if we'd gone any farther down we would have been going slower and slower. Slower, and slower, and slower. A little closer, and that fifteen minutes would have turned out to be a decade. A little closer still, and it would have been a century. It was *that* close, Sigfrid. We were almost trapped, all of us.

"But I got out."

And I think of something and look at my watch. "Speaking of time, my hour's been up for the last five minutes!"

"I have no other appointments this afternoon, Bob."

I stare. "What?"

Gently: "I cleared my calendar before your appointment, Bob."

I don't say "Holy Christ" again, but I surely think it. "That makes me feel right up against the wall, Sigfrid!" I say angrily.

"I am not forcing you to stay past your hour, Bob. I am only pointing out that you have that option if you choose."

I mull that for a while.

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Dear Voice of Gateway:

On Wednesday of last week I was crossing the parking lot at the Safeway Supermarket (where I had gone to deposit my food stamps) on the way to the shuttle bus to my apartment, when I saw an unearthly green light. A strange spacecraft landed nearby. Four beautiful, but very tiny, young women in filmy white robes emerged and subjected me helpless by means of a paralyzing ray. They kept me prisoner on their craft for nineteen hours. During that time they subjected me to certain indignities of a sexual nature which I am honor-bound not to reveal. The leader of the four, whose name was Moira Glow-Fawn, stated that, like us, they have succeeded in fully overcoming their animal heritage. I accepted their apology and agreed to deliver four messages to Earth. Messages One and Four I may not announce until the proper time. Message Two is a private one for the manager of my apartment project. Message Three is for you at Gateway, and it has three parts: 1, there must be no more cigarette smoking. 2, there must be no more mixed schooling of boys and girls at least until the second year of college. 3, you must stop all exploration of space at once. We are being watched.

Harry Hellison,
Pittsburgh.

"You are one brassbound ringding of a computer, Sigfrid," I say. "All right. Well, you see, there was no way we could get out, considered as a unit. Our ships were caught, well inside the point of no return, and there just ain't no way home from there. But old Danny A., he was a sharp article. And he knew all about the loopholes in the laws. Considered as a unit, we were stuck.

"But we weren't a unit! We were two ships! And each of them came apart into two other ships! And if we could somehow transfer acceleration from one part of our system to the other—you know, kick part of us deeper into the well and at the same time kick the other part up and out—then *part* of the unit could go free!"

Long pause.

"Why don't you have another drink, Bob?" says Sigfrid solicitously. "After you finish crying, I mean."

XXX

Fear! There was so much terror jumping around inside my skin that I couldn't feel it any more; my senses were saturated with it; I don't know if I screamed or babbled, I only did what Danny A. told me to do. We'd backed the two ships together and linked up, lander to lander, and we were trying to

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We sometimes get squashed,
and we sometimes get burned,

And we sometimes get
shredded to bits,

And we sometimes get fat
on the Royalties Earned,

And we're always scared
out of our wits.

We don't care which—

Little lost Heechee,
start making us rich!

---

manhandle gear, instruments, clothes, everything that moved out of the first ship into whatever corners we could find of the second, to make room for ten people where five were a tight fit. Hand to hand, back and forth, we bucket-brigaded the stuff. Dane Metchnikov's kidneys must have been kicked black and blue; he was the one who was in the landers, changing the fuel-metering switches to blow every drop of hydrox at once. Would we survive that? We had no way of knowing. Both our Fives were armored, and we didn't expect to damage the Heechee-metal shells. But the contents of the shells would be us, all of us in the one of them that went free—or we hoped would go free—and there wasn't really any way to tell whether we could come free in the first place, or whether what would come free would be nothing but jelly anyway. And all we had was minutes, and not very many of them. I guess I passed Klara twenty times in ten minutes, and I remember that once, the first time, we kissed. Or aimed at each other's lips, and came close enough. I remember the smell of her, and once lifting my head because the musk-oil was so strong and not seeing her, and then forgetting it again. And all the time, out of one viewscreen or another, that immense broad baleful blue ball hung flickering outside; the racing shadows across its surface that were phase effects made fearful pictures; the griping grab of its gravity waves tugged at our guts. Danny A. was in the capsule of the first ship, watching the time and kicking bags and bundles down to the lander hatch to pass on, through the hatch, through the landers, up to the capsule of the second ship where I was pushing them out of the way, any which way, just to make room for more. "Five minutes," he'd yell, and "Four minutes!," and "*Three minutes, get the goddamn lead out!*" and then, "That's it! All of you! Drop what you're doing and come on up here." And we did. All of us. All but me. I could hear the others yelling, and then calling to me; but I'd fallen behind, our own lander was blocked, I couldn't get through the hatch! And I tugged somebody's duffelbag out of the way, just as Klara was screaming over the TBS radio, "Bob! Bob, for God's sake, get up here!" And I knew I was too late; and I slammed the hatch and dogged it down, just as I heard Danny A.'s voice shouting, "*No! No! Wait. . . .*"

Wait. . . .

Wait for a very, very long time.

XXXI

After a while, I don't know how

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NOTICE OF CREDIT

To ROBINETTE BROADHEAD

1. Acknowledgement is made that your course-setting for Gateway II permits round-trip flights with a travel time saving of approximately 100 days over the previous standard course for this object.

2. By decision of the Board, you are granted a discovery royalty of 17. on all earnings on future flights using said course-setting, and an advance of $10,000 against said royalty.

3. By decision of the Board, you are assessed one-half of said royalty and advance as a penalty for damage to the vessel employed.

Your account is therefore CREDITED with the following amount:

Royalty advance (Board Order A-135-7), less deduction (Board Order A-135-8):	$5,000
Your present BALANCE is:	$6,192

---

long, I raise my head and say, "Sorry, Sigfrid."

"For what, Bob?"

"For crying like this." I am physically exhausted. It is as if I had run ten miles through a gauntlet of mad Chocktaws pounding me with clubs.

"Are you feeling better now, Bob?"

"Better?" I puzzle over that stupid question for a moment, and then I take inventory, and, curiously enough, I am. "Why, yeah. I guess so. Not what you'd call *good*. But better."

"Take it easy for a minute, Bob."

That strikes me as a dumb remark, and I tell him so. I have about the energy-level of a small, arthritic jellyfish that's been dead for a week; I have no choice but to take it easy.

But I do feel better. "I feel," I say, "as if I let myself feel my guilt at last."

"And you survived it."

I think that over. "I guess I did," I say.

"Let's explore that question of guilt, Bob. Guilt why?"

"Because I jettisoned nine people to save myself, asshole!"

"Has anyone ever accused you of that? Anyone but yourself, I mean?"

"Accused?" I blow my nose again, thinking. "Well, no. Why should they? When I got back I was kind of a hero." I think about Shicky, so kind, so mothering; and Francy Hereira holding me in his arms, letting me bawl, even though I'd killed his cousin. "But they weren't there. They didn't see me blow the tanks to get free."

"*Did* you blow the tanks?"

"Oh, hell Sigfrid," I say, "I don't know. I was going to. I was reaching for the button."

"Does it make sense that the button in the ship you were planning to abandon would actually fire the combined tanks in the landers?"

"Why not? I don't know. Anyway," I said, "you can't give me any alibis I haven't already thought

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NOTICE OF CREDIT

To ROBINETTE BROADHEAD.

Your account is CREDITED with the following amounts:

Guaranteed bonus for Mission 88-90A and 88-90B (survivorship total):	$10,000,000
Science bonus awarded by Board:	$8,500,000
Total:	$18,500,000
Your present BALANCE is:	$18,500,036

of for myself. *I* know maybe Danny or Klara pushed the button before I did. But I was reaching for mine!"

"And which ship did you think would go free?"

"Theirs! Mine," I corrected myself. "No, I don't know."

Sigfrid says gravely, "Actually, that was a very resourceful thing you did. You knew you couldn't all have survived. There wasn't time. The only choice was whether some of you would die, or all of you would. You elected to see that somebody lived."

"Crap! I'm a murderer!"

Pause, while Sigfrid's circuits thought that over. "Bob," he says carefully, "I think you're contradicting yourself. Didn't you say she's still alive in there?"

"They all are! Time has stopped for them!"

"Then how could you have murdered anybody?"

"What?"

He says again, "How could you have murdered anybody?"

". . . I don't know," I say, "but, honestly, Sigfrid, I really don't want to think about it any more today."

"There's no reason you should, Bob. I wonder if you have any idea how much you've accomplished in the past two and a half hours. I'm proud of you!"

And queerly, incongruously, I believe he is, chips, Heechee circuits, holograms and all, and it makes me feel good to believe it.

"You can go any time you want to," he says, getting up and going back to his easy chair in the most lifelike possible way, even grinning at me! "But I think I would like to show you something."

My defenses are eroded down to nothing. I only say, "What's that Sigfrid?"

"That other capability of ours that I mentioned, Bob," he says, "the one that we've never used. I would like to display another patient, from some time back."

"Another patient?"

He says gently, "Look over in the corner, Bob.

I look—

—and there she is.

"Klara!" And as soon as I see her I know where Sigfrid got it; from the machine Klara was consulting back on Gateway. She is hanging there, one arm across a file rack, her feet lazily floating in air, talking earnestly; her broad black eyebrows frown and smile, and her face grins, and grimaces, and then looks sweetly, invitingly relaxed.

"You can hear what she's saying if you want to, Bob."

"Do I want to?"

"Not necessarily. But there's

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nothing in it to be afraid of. She loved you, Bob, the best way she knew how. The same as you loved her."

I look for a long time, and then I say, "Turn her off, Sigfrid.

In the recovery room I almost fall asleep for a moment. I have never been so relaxed.

I wash my face, and smoke another cigarette, and then I go out into the bright diffuse daylight under the Bubble, and it all looks so good and so friendly. I think of Klara with love and tenderness, and in my heart I say good-by to her. And then I think of S. Ya., with whom I have a date for that evening—if I'm not already too late for it! But she'll wait; she's a good scout, almost as good as Klara.

Klara.

I stop in the middle of the mall, and people bump up against me. A little old lady in short-shorts toddles over to me and says, "Is something wrong?"

I stare at her, and don't answer, and then I turn around and head back for Sigfrid's office.

* * *

There is no one there, not even a hologram. I yell, "Sigfrid! Where the hell are you?"

No one. No answer. This is the first time I've ever been in the room when it wasn't set up. I can see what is real and what was hologram now; and not much of it is real. Powder-metal walls, studs for projectors. The mat (real); the cabinet with the liquor (real); a few other pieces of furniture that I might want to touch or use. But no Sigfrid. Not even the chair he usually sits in. "Sigfrid!"

I keep on yelling, with my heart bubbling up in my throat and my brain spinning. "Sigfrid!" I scream, and at last there is a sort of a haze and a flash and there he is in his Sigmund Freud suit.

"Yes, Bob?"

"Sigfrid, I did murder her! She's gone!"

"I see that you're upset, Bob," he says. "Can you tell me what it is that's bothering you?"

"Upset! I'm worse than upset, Sigfrid, I'm a person who killed nine other people to save his life! Maybe not 'really!' Maybe not 'on purpose!' But in their eyes I killed them, as much as in mine!"

"But Bob," he says reasonably, "we've been all over this. She's still alive; they all are. Time has stopped for them—"

"I know," I howl. "Don't you understand, Sigfrid? That's the point. I not only killed her, *I'm still killing her*!"

Patiently: "Do you think what you just said is true, Bob?

"*She* thinks it is! Now, and forever, as long as I live. It isn't years ago that it happened for her. It's only a few minutes, and it goes on for all of my life. I'm down here, getting older, trying to forget, and there's Klara up there in Sagittarius YY, floating around like a fly in amber!"

I drop to the bare plastic mat, sobbing. Little by little Sigfrid has been restoring the whole office, patching in this decoration and that. There are piñatas hanging over my head, and a holopic of Lake Garda at Sirmione on the wall,

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hoverfloats, sailboats and bathers having fun.

"Let the pain out, Bob," Sigfrid says gently. "Let it all out."

"What do you think I'm *doing*?" I roll over on the foam mat, staring at the ceiling. "I could get over the pain and the guilt, Sigfrid, if *she* could. But for her it isn't over. She's out there, stuck in time."

"Go ahead, Bob."

"I *am* going ahead. Every second is still the newest second in her mind—the second when I threw her life away to save my own. I'll live and get old and die before she lives past that second, Sigfrid."

"Keep going, Bob. Say it all."

"She's thinking I betrayed her, and she's thinking it *now*! I can't live with that."

There is a very, very long silence, and at last Sigfrid says:

"You are, you know."

"What?" My mind has gone a thousand light-years away.

"You are living with it, Bob."

"Do you call this living?" I sneer, wiping my nose with another of his million tissues.

"You respond very quickly to anything I say, Bob," says Sigfrid, "and therefore sometimes I think your response is a counterpunch. You parry what I say with words. Let me strike home for once, Bob. Let this sink in: You *are* living."

". . . . Well, I suppose I am." It is true enough, it is just not very rewarding.

Another long pause, then:

"Bob. You know that I am a machine. You also know that my function is to deal with human feelings. I cannot *feel* feelings. But I can represent them with models, I can analyze them, I can evaluate them. I can do this for you. I can even do it for myself. I can construct a paradigm within which I can assess the value of emotions. Guilt? It is a painful thing; but because it is painful it is a behavior modifier. It can influence you to avoid guilt-inducing actions, and this is a valuable thing for you and for society. But you cannot use it if you do not feel it."

"I *do* feel it! Jesus Christ, Sigfrid, you know I'm feeling it!"

"I know," he says, "that now you are letting yourself feel it. It is out in the open, where you can let it work for you, not buried where it can only harm you. That is what I am for, Bob. To bring your feelings out where you can use them."

"Even the bad feelings? Guilt, fear, pain, envy?"

"Guilt. Fear. Pain. Envy. The motivators. The modifiers. The qualities that I, Bob, do not have, except in a hypothetical sense, when I make a paradigm and assign them to myself for study."

There is another pause. I have a funny feeling about it. Sigfrid's pauses are usually either to give me time to let something sink in, or to permit him to compute some complex chain or argument about me. This time I think it is neither of them. He is thinking, but not about me. And at last says, "So now I can answer what you asked me, Bob."

"Asked you? What was that?"

"You asked me, 'Do you call this living?' And I answer: 'Yes. It is exactly what I call living. And in my best hypothetical sense, I envy it very much.' " ★

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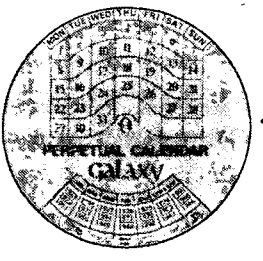

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Jerry Pournelle, PhD

PROMISES AND A POTPOURRI

THERE'S A WORLD Science Fiction Convention next week and I've got to go because I'm chaircritter of two panels. I'm behind on two novels, the telephone won't stop ringing, and my editor's in town to tell me that if I don't finish his book according to contract he'll put out a contract on me. And Jim Baen just called to say this column must be in before the Worldcon . . .

If you think a writer's life is one of quiet laziness punctuated at infrequent intervals by flurries of typing, you're partly right. I can remember those dear dead days when I could read my magazines and work when I felt like it—but now it's time to pay for the privilege, and it's only fair to make you *Galaxy* readers pay too. After all, one way I use up time is answering letters—and incidentally, to those whose letters don't get answered, you have my sincere apologies.

You may even get an answer one of these days. My desk consists of stratified layers of paper, and sometimes when I can't stand it any longer I conduct an archeological expedition down to wood—and thus are cast to the surface letters placed on my desk as warranting a better answer than a one-minute postcard, only to be covered by something else that shouldn't be forgotten . . .

The way you will pay is this: my column this month consists of bits and pieces which might, with enough ingenuity, be woven into a theme, but since I haven't time you're getting an intellectual potpourri.

* * *

One reason I ran out of time was that the Avalon Hill Company has sent me (no doubt with malice aforethought) a copy of their new war games, *Starship Troopers*. It is, of course, based on Robert Heinlein's story, and carries not only his

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letter of endorsement, but in the manual of rules has memorabilia of Lt. Juan Rico, MI (complete with his photograph, excerpts from letters he received, etc.)

If you like war games, or if you like science fiction, or if you hate both but liked *Starship Trooper*, you'll love this. I wouldn't have thought that the complexities of war as related by Mr. Heinlein could be turned into a set of rules, but Avalon Hill has done it. There are a series of games of increasing complexity; the early ones are playable because my son and I tried them (well, I had to try it before I could give A-H an authoritative comment, didn't I?), but I suspect that the later scenarios are playable only by fanatics who possess a computer, a General Staff, and a great deal of time. No matter: the earlier and less complex scenarios are fun. If you're looking for a present for a (chronologically or temperamentally) teenaged friend, I recommend this; and if your friend hasn't read the book, get that too. The package would have overjoyed me in the days of my youth. Of course I'm a bit old for that sort of thing now . . . Eh? What's that, it's my move? Be right there.

* * *

I have noticed that the gaming mania seems to have swept the science fiction community; at every convention there are about as many games sold in the huckster rooms as there are books. One of those madnesses is a thing called Dungeons and Dragons, which seems to be a form of collective psychoses complete with audio-visual hallucinations. The worst of it is, I once, flippantly I'll swear, remarked that it might be interesting to take an expedition of mercenary troops—commanded by Colonel John Christian Falkenberg, of course—into one of those dungeons.

(Confucius say he who does not toot own bassoon, same will not be tooted. About the time this column is on the stands Pocket Books will have out *The Mercenary* by Jerry Pournelle, which is a collection of most of the published Falkenberg stories plus about 40 pages of original material including the marching song of the Line Marines.)

I'm told that a committee of Dungeonmasters has taken me up on the challenge, and at some point in the near future I will be invited to send Falkenberg's 42nd Legion into a world of dragons, wizards, elves, balrogs, vampires, and various forms of slimes, molds, death spells, etc. I can hardly wait, and meantime the regimental armorer is casting silver bullets and filling Flit guns with carbolic acid . . .

All this wouldn't have used up so much time, but of course there's Viking. We had quite a party on July 20, 1976. Larry and Marilyn Niven, myself, Poul and Karen An-

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derson, Ted and Wina Sturgeon, Robert and Virginia Heinlein, and Ray Bradbury were all at JPL to watch the landing. It came at an ungoldly hour, but no one really noticed that. We were too busy staring at the screen as, line by line, the image built up: a close-up look at the surface of Mars.

As Mr. Heinlein said, July 20 is likely to be an important date in human history for quite a long time to come. First Eagle, then Viking—and you know, with no intent to be unpatriotic at all, I agree with Robert: mankind may well remember the significance of July 20 a long time after most people have forgotten why July 4 is important.

As I write this, Viking II hasn't landed yet (it's scheduled to touch down during the World Convention, alas) and nobody knows *what* to make of the information streaming in from the first lander. The biology team can't figure it out, and the geology people are having small fits of their own.

Biology: 'If we got these results from a sample picked up on Earth we wouldn't hesitate to say they indicated biological activity.''

Geology: ''No, we don't have the slightest idea why the Martian soil has that consistency. No, it's not water. No, it's not . . .''

The biological question will probably be resolved one way or another by the time you read this. The soil consistency question probably won't be. The Martian desert landscape looks sandy. We *know* there's dust. And yet, the sampler arm digs its little trench—and the trench remains. It doesn't crumble at the edges. The soil sample has a consistency of lumpy clay, yet there's no water to hold it together. Why isn't it sandy, fine-grained? You haven't the time to listen to the theories proposed, and none I've heard account for all the data.

And why is that surprising? It's *another planet*. It *ought* to be strange, different, unusual, weird even. Yet we are surprised; and that's worth thinking about.

We have come to expect marvels from science and technology, and particularly from the space program. Ted Sturgeon—and others, so many others that I haven't a clue as to who said it first, but possibly Ted—has said that NASA's *greatest* miracle was to make Mankind's most magificent achievement *dull*. We achieved so much that the miraculous became routine. There's excitement, all right—I was privileged to attend some of the Viking scientific steering meetings at JPL, and there was intellectual gore enough for anyone—but it doesn't get out to the public.

Yet think about it. Here's this enormously sophisticated machine flung across millions of miles of space, landing with no more impact than you'd feel jumping off a chair; it sends back highly detailed photographs, using in transmission about

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the energy of the light-bulb in your desk-lamp, and getting that power from tiny radioactive-isotope-generating systems; it digs holes in the Martian landscape and subjects them to tests not even possible on Earth when I was in school; it's done all that for less than one percent of one year's worth of the national budget—about $4.50 for each of us in these United States; and we *expected* it to work, first crack.

So far have we come. I recently read a history of Polar exploration. Attempt after attempt, each one getting closer, each ending in failure, some in tragedy, until the final triumph; and each failure spurred renewed effort. I sometimes wonder if the greatest tragedy of our space program was that we had so little tragedy. Would we have seen Apollo as more splendid if space had killed more heroes?

Since a lot of those people were friends of mine, and it was my job (along with a lot of others) to see that they came home healthy, I never did nor ever could wish for tragedy in space; but might not the public take more interest in our achievements if we had not been so routinely successful?

In my columns and lectures I often tell of the marvels about to be poured forth from technology's cornucopia. I describe a world of the future with colonies in space, minerals brought from the asteroids, a world-wide standard of living at

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least as high as what we in the United States enjoy now; and I am careful to say that I am not describing dreams. This is the world as it can be made, as we already know how to make it. We can do it, I say. And it doesn't even cost much: a few more cents out of each tax dollar.

I gave that lecture in Salt Lake City recently. (Salt Lake City is the only place I've ever visited where the words "wild life" refer exclusively to ecological phenomena.) After the question period I stood talking with some of my audience, and a young lady asked a very serious question. "You tell us about all the benefits technology can bring us, and you say you only need a little more money to accomplish all these marvels. I'm not an engineer. I don't even understand about half of what you said in there. I'd like to believe you, but—how do I know you can do it if we give you the money?"

It was asked in all sincerity. Most of my audience wasn't technically trained, and indeed in this case weren't even very familiar with science fiction, and though I've evidence they were entertained, I knew too that some of the things I'd talked about were unfamiliar. I could probably convince an engineer or mathematician or economist that my forecasts make sense; but how to prove to a bright young English teacher that I wasn't just blowing smoke, that it wasn't all just promises, promises?

I had to say something, and I heard myself saying this: "Of those who make you promises, which group has a better track record for keeping them: technologists or politicians?" She seemed satisfied; and later I reflected on just what I'd said. It makes more sense than I knew.

Remember twenty years ago when the politicians and "social scientists" were saying that if only they had as much money as the Defense Department, they would transform America into Paradise? Well, they've got what they asked for and a lot more. I can recall when Congress dared not bring in a budget larger than the "barrier" figure of $100 billion. Now there's no obvious stopping point short of a trillion—and not much of the increase went to Defense. Do we live in Paradise?

In 1958 some of us said that if we could have about 3% of the national budget we could put men on the Moon and go to the planets. We said that the nation would reap great benefits from communications and weather satellites, and that the ferment of high-technology enterprises generated by the space program would have unforseeable effects of enormous benefit to all. Have those promises been kept?

In the 50's advocates of "federal aid to education" were saying that if we merely shoveled a bit more money into education we'd not only

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see that every Johnny could read, but produce a generation fit to live in "the atomic age". Well, education certainly can't complain that it didn't get far more than was asked for (asked for then; not as much as is wanted now, of course); but would anyone like seriously to argue that we have fewer problems with the schools now than we did then?

And no: I do not mean this as a condemnation of educators and politicians and social scientists. I do not mean to imply that there may be serious problems not forseen by those forcasters of the 50's. I don't even mean to condemn those who tell us what's needed is still more money for education and social services and the like. I do mean this: of those who have said they could produce certain results given certain investments, who has the best track record? And yes, I know about cost over-runs (back in my aerospace days I was mildly famous for Pournelle's Law of Costs and Schedules, namely, "Everything takes longer and costs more," a dictum discovered independently by myself and Poul Anderson).

I could even tell you horror stories of my own. Some of them aren't the engineers' fault, though. Freeman Dyson told me about the laser target, the one placed on the Moon by Neil Armstrong: essentially a box full of glass cubes. They asked the instrument makers at Princeton what it would cost, and were told a couple of thousand dollars at most; by the time the competitive bid process was done, the cost was about a quarter of a million. But sometimes the engineers and technology managers seriously underestimate their costs, and seriously over-estimate the results. Sometimes they build outright failures, bridges that fall down and airplanes that don't fly very well. But he honest. How often have we been given an order of magnitude more money and failed to produce the promised result? Or any result at all? And how many political programs do you know of that cost ten times as much as estimated, are seemingly eternal in duration, and produce no measurable result at all?

Choose your own examples; I'd not like to pick on your favorite project for social improvement. I do recall Dr. Samual Johnson on the subject.

Boswell: "Then, sir, you laugh at schemes for social improvement?"

Johnson: "Why, sir, most schemes for social improvement are very laughable things."

And yet in my youth no one laughed when we were told that for $200 billion—not annually, but just $200 billion—we could transform the world, and they did indeed laugh when told that we could go to the Moon at any price whatever.

I rest my case.

I can't drop the subject of promises and Dr. Freeman Dyson, though.

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* * *

I suspect that few *Galaxy* readers ever heard of "Recombinant DNA Research," but the subject is likely to be of vast importance to all of us, and it won't be long before it gets into the political headlines; indeed, by the time this is published it may be the question of the hour for your local city council or county board of supervisors.

Last July the Cambridge Mass. city council found itself required to debate and rule on whether to allow DNA research at Harvard University and MIT; and those are hardly the only institutions whose biologists are eager to get to work.

DNA, or D-Nucleic Acid is the long-chain spiral molecule that determines genetics and inheritance, and it takes many forms. Recently biologists have learned how to take DNA from one plant or animal and make it combine with DNA from reproductive cells of entirely different species.

The results can be strange. "Plantimals," neither plant nor animal, have been produced. Grotesque cells combining DNA from both human and mouse have survived to multiply by simple fission. More importantly, new forms of bacteria with properties of more than one of the species that went into their genesis have emerged from the laboratories.

Recombinant DNA research will, some biologists tell us, teach us more about life and biology than everything man has learned since the beginning of time. The results can be highly practical. In a recent letter to *Science* magazine Dr. Freeman Dyson (Institute for Advanced Study) said:

"I claim that the exploitation of recombinant DNA techniques may lead to an understanding, and conceivably a cure, of cancer . . . to creation of improved food plants to save hundreds of millions of people from starvation . . . to energy crops to offer alternatives to nuclear fission and fossil fuels."

Many biologists agree. Some predict even greater benefits. Certainly the potential good from recombinant DNA research is not small.

The trouble is, equally prestigious scientists are terrified. The Cambridge city council didn't get into the debate because of anti-intellectual feeling. Men as reputable as Dyson explained the dangers and demanded the hearings.

Much of the DNA research is done with a bacteria called *E. coli*, which is universally present in human intestines. Suppose the research produces a bug which can live in humans—*E. coli* is admirably adapted for that—and gives everyone typhus? Recombinant DNA could conceivably unleash an entirely new disease for which we have neither cure nor natural immunity. It might produce a cancer-*causing* bug which, once released,

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could never be exterminated.

It might solve the problem of famine, but not quite in the way advocates of recombinant DNA research hope for.

Advocates of DNA research admit all this, but point out that after two years of study the National Institutes of Health have released guidelines for such research, and these are more than adequate to protect the public. The most dangerous kinds of research, those involving organisms that might affect human health, must be done in completely sealed environments such as were used by the Army for biological warfare research before the United States terminated those programs.

They also say you can't stop it: the techniques are complex, but the equipment isn't *that* expensive, so some researchers will do the work whether permitted or not. Better, they say, to have it under license and supervision. After all, a moderately well-equipped high school laboratory could support recombinant DNA research although certainly not safely.

I hear tales of virus-bacteria combinations which weren't supposed to be viable but inexplicably were, and which lived on human tissue-cultures until destroyed. I don't know if the stories are true, but my biochemistry friends tell me it's not impossible. The dangers, like the benefits, are not small, and are very real.

We have here a legitimate disagreement among scientists of high integrity and great stature; and it is a question which must be answered by the general public and our political institutions. If there's a final answer to this question, I don't know it. I think both sides are right: the potential benefits are enormous, but the potential hazards are equally so. For what it's worth I think the dangers of disaster are far less probable than the promise of blessings, and I've some confidence in the techniques proposed to isolate and control any resulting demon; but no one can be 100% certain.

The Army took prodigious measures to keep its research safe and confined (as well as secret) but there were accidents. Sheep died in Colorado. Improbable that (1) anything would get out, (2) if it did it could live, and (3) if it got out and lived it would be virulent and (4) uncontrollable; but that multiple probability is *not* zero.

My own suggestion (one which Jim Baen guessed when I outlined the problem and before I made my suggestion) is that the truly dangerous activities ought to be put off until we can do the work in orbiting laboratories or on the Moon. Then we can be *sure* that an accidental release of research organisms won't contaminate the Earth. But—can we wait that long? Suppose there is famine on the Earth, and we find later that had we started the research this year a famine-preventing

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grain would have been found in time? Would not the responsibility for millions dead of starvation weigh heavily on those who played it safe?

I know this: if we had continued the space program as we ought to have continued it, instead of converting the money into fuel to feed political promises, we'd *have* those orbiting labs, aye and a Moon base as well.

Meanwhile, in nearly every large university the biologists are tooling up; and except for the Cambridge city council, which until a month ago had never heard of Recombinant DNA, the state and local authorities haven't even considered the problem.

* * *

One last item for our intellectual chicken soup: do you grieve for endangered species? Do you mourn the passing of even the insignificant, believe that nothing should ever be totally exterminated? Then I have a candidate for your defense efforts.

This year, 1977, will see the extirpation of the smallpox virus. As I write this, smallpox, which a few years ago claimed millions of lives each year, now exists only in laboratories and in one small village in Ethiopia; in a year the only living virus will be in the laboratories.

Already we no longer vaccinate children in the U.S. The (small) danger of unfavorable reaction to the vaccination is greater than the danger of smallpox. The WHO has removed the requirement for current vaccination from the medical passport.

But shall we preserve samples of the virus? Surely Pournelle jests? No. There are serious proposals that we preserve this endangered species.

The argument is that smallpox virus is one of the few viruses which live only in man. (It has, so far as we know, no animal reservoir and no vector save man-to-man contact, which is why it could be eradicated in such a short time.) Would it not be well to preserve samples of this virus that lives only in man, so we can find out why it picks on us and nothing else? Were we to learn that characteristic might it not be enormously valuable? Might it not, if isolated from the disease-causing characteristics, be a useful gene to breed into other viruses which we hope to create from recombinant DNA research? And so forth.

Others say, to the Devil with the the pox! and reach for the carbolic acid.

I suppose I could have woven a theme into this intellectual porridge after all. How are those not of a technical bent to live in a world of science and technology? And of the promises, promises, whose shall they believe? I wish I had final answers to those questions; I do not. But I'm not at all sorry I've made you think about them. ★

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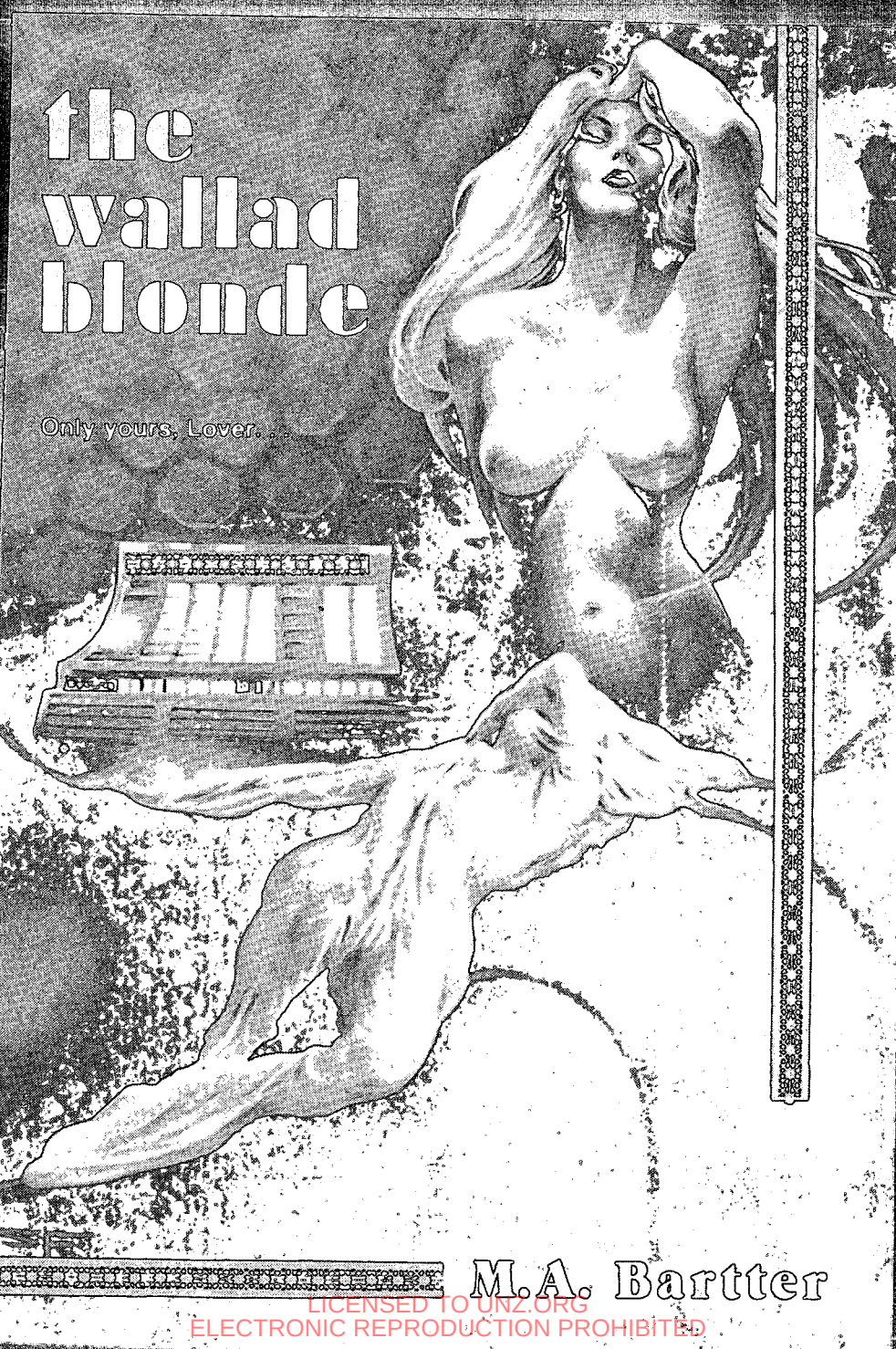
the walled blonde



M.A. Bartter

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BEN SHARAYDE PAUSED on the mica-flecked walkway while his eyes adjusted from the dimness of the transpod. The street, at ten-thirty on a workday morning, was full of strolling people; he missed the purposeful rush.

It was an oddly heady feeling to walk through the diffracted sunlight that penetrated the dome's crust of winter grime, to note that it was time for spring cleaning: as if in his transitory importance he could order it done. Sharayde smiled at his own conceit.

A passing semireg eyed him with open envy, contrasting his own dull-tan uniform to the iridescent navy skinsuit and scarlet-ruffled vestjac Ben had donned for the bristening. He'd looked exactly right; and he'd acted as casually blasé as if he'd been honored before.

He didn't even have to hurry. Paul Savin had been glad to allow him the morning off; indeed, he might have been willing to excuse him for the entire day, so impressed was he that Ben was to name not one, but two infants. Only Citycouncilman Mayer had outgunned him with three boys. Ben found he was grinning with unconscious pride, and carefully blanked his expression. No use attracting attention from the service workers heading for late-morning half-shifts, the tourists clumped before store windows in their oddly fashioned out-city clothing, or the uniformed Cops alert at their staggered posts.

A hoarse shout and a shove snapped him from his reverie; he looked up to see a workcrew gravving down the wall while the burly man beside him yelled instructions. They hit the pavement with a clatter, and commenced to slam their rig into its powercrate with a violence that made Ben, used to fragile artist's implements, wince. The strawboss ignored them, staring up at the windowless expanse of brick and waving.

There was a snap and a low hum: like a shimmering curtain, a porno swept across the building.

The girl posing in the wall was honeyblonde, lightly bronzed, her long face accented by dark brows and arched, patrician nose. She smiled with knowing lips. Erect, fully curved, her body avoided the satchel-bottomed sensuality common among models. Her message tapped Ben's ears as he strolled past her mil-thick essence: "ONLY YOURS, lover." An erotic emotive enhanced his reaction.

Shebinoff handled the Only Yours account; where had he found her? Ben made a mental note to seek Sheb out at lunch and compliment him. It would also provide a perfect opportunity to remind his co-workers where he'd been this morning, and receive their envious congratulations.

Already the wallad had gathered a small crowd. A tall black in a gold skinsuit stopped abruptly in front of Ben, who sidestepped into

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a stocky man whose sombre kilt marked him an outcity tourist. The tourist glared. Ben excused himself, stepped back, was jostled forward, bumped the heavily-muscled black, and worked himself out of the crush.

Exciting as the ad was, he needn't waste time on it. Ben knew he was a loner, conspicuous by his nonattendance at groupins and bashes, but he usually found companions who were impressed by his unconventionality. Just wait till they heard about his double honor!

And there was always Cydra.

Still, he found something attractively artistic in the height of the blonde's forehead, the curve of her lips, the depth and timbre of her voice. If she was really available. . .Ben caught himself. It was only an ad! One he'd never notice ordinarily, hurrying past, worried about schedules and ripoffs and hustlers.

Suddenly the half-empty street, the alert Cops surveying naive tourists and lackadaisical semiregs, reminded Ben that this was a high-risk district. He was usually too rushed, too insulated among thousands like himself, to be nervous about it.

Savin AdArt occupied the top three floors of a grimed stone building near the domewall. A few ruins crumbled against the dome itself, but when the ultraplas hemisphere was clean, Sharayde could look over them from his studio window at foamed, restless ocean. Today, as he sat at his desk, he was glad of the encrusted spray; he was almost too distracted to work, as it was.

He uncovered the nearly finished dimenso on his block and stared at it critically. It looked distorted, flat; something was wrong with it, something as definite yet elusive as a touch of ozone in conditioned air, or sudje in a liqueur, but he couldn't put his finger on it. He'd been satisfied with it last night.

Mere retouching wouldn't revitalize it. His first impulse was to strip the block and start fresh, but the layout was on deadline. The dimensional effect was adequate; no more than that, not up to his usual standard, but good enough for EZSleep, a minor account. It would sell.

He'd add just one hilite layer instead of the four he'd originally intended, and call it done.

* * *

No new assignment showed up in his slot after lunch. Lesser artists might be set to filling roughs or adding layers of translux to dimensos, instead of working on their private sketchblocks. To Ben, still glowing from his co-workers' congratulations, the freedom from scurryboy busywork seemed no more than his due. His stylo skimmed the block, building in unconscious harmony of memory and skill the record of his morning: the dim, elegant chapel, the bored Crèche officials, the

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black-robed chanter, the debonair snob Mayer, the fatuous citizens who'd insisted on touching their namesakes, trying to wheedle a response from the lightly drugged infants. Thank god he'd avoided both extremes!

He experimented briefly with patterns of the domecrust on the walkway, then found himself intently sketching the dazed, concentrated stare of the corn-rowed black beneath the wallad.

How would he look, a dark naked god, braced on the seawall against flying spray? With sunset outlining thick, tensed muscles, and the wavecrests crimson, and his face locked into the force of his desire?

It might—just might—work into something prizeworthy.

Savin could find a client for it; medals weren't awarded noncommercial drivel, but he'd never failed to back Ben from the time he'd first encouraged him to enter the Annual Open Artshow, where an Honorable Mention in 2182 led to the Alwark Invitational. Ben had every reason to believe this morning's honor came from the Bronze Medal he'd won there.

The sketch could go no further without commercial application. Ben stretched stiff shoulders, noting the time with astonishment. No one had stopped in to remind him of quitting time. They probably felt shy, after this morning, about interrupting his work.

If he didn't leave immediately, he'd be caught by mechocleaners attacking the litter on desks and floor. He'd made that mistake just once, and nearly lost the ruffles off his trousers.

Domeglow threw menacing shadows over the walkway. The glowing wallad winked knowingly. Few gazing up at it wore citizen's skinsuits. Most nightwalkers were nonregs in their shabby, mixed garb, hustling a livlihood from tourists, the compassionate, and each other. The wallad blonde was a hustler, too, Ben thought absently. It added a spice of danger to her appeal.

Something plucked at the lapel of his vestjac. Sharayde slapped at his pocket and howled, wringing his gashed palm.

A slim urchin darted down the walk, turning with a flash of narrowed eyes and pale, unchildishly snarling lips before dodging behind a fat, bundle-burdened woman.

The boy had slashed his criticard right out of his pocket. Ben pointed with a blood-dripping hand and yelled, "Stop that boy! He's a ripoff!"

"What boy?" the woman yelped, dropping her sacks and clutching her own pocket.

"This boy?" A big semireg lifted a screaming blonde boy by the scruff. Spectators crowded, clutching the struggling child.

"Not him. Taller, darker, close-cropped hair. . ."

The semireg shrugged, dropped

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the child and turned away.

Ben stood shaking weakly; shocked, hurt, marooned, cardless. Alone among a crowd whose interest was gone he felt totally helpless.

"How bad did he get you, mister?"

Ben suppressed the urge to clutch the big, broadfaced Cop for support.

"Benjamin Sharayde," Ben stammered. "He cut me pretty deep, I think." He held out his hand but the Cop ignored it. Ben fished up a tissue and clumsily wrapped the gory cut. "He got my card."

"Ident, please."

Not a word of blame! Encouraged, Ben rattled off his number.

"You'll have to come to the station for I.D. and treatment. There's no hope of catching the ripoff here, but if you can give a good description, we may be able to make him. We've got this area pretty well plotted." The Cop took Ben's elbow and half lifted him into the silver autocar.

"I can do better than describe the little bastard. I can draw him for you," Ben said grimly. "I got a good look at him."

"Witnesses always say that. Mostly they're mistaken." The autocar hummed down the street-guides, slipped through the station diaphragm.

"I'm a working artist. Just give me a sketchblock and stylo."

"Citizen Benjamin Sharayde," the Cop formally informed the Deskman as he helped Ben from the car. "I flashed you."

"Right. Citicard ripoff. Injured hand." The Deskman punched his console, and a young woman hurried in with a medical float. Ben winced as she unwrapped the bloody tissue and wiped the slash with anesthetic, then turned his attention to the pen and paper the Deskman was offering, and almost laughed. They expected him to draw on the back of a computer run? Still, a real artist could use anything, even a cave wall and colored mud.

Clips closed his numbed hand; he worked with quick strokes, and the boy's lean, leering face glared at them from the paper.

"Lenny Two," the Cop exclaimed as Ben roughed in the cropped hair. "Maybe this time we can get him before he blanks the card!"

"Does what?"

"He's part of a regular gang," the Deskman explained, punching buttons. "Run citicards through a hand-made processer, and switch numbers. Can't fake the interior circuitry, of course, but they'll pass in public slots, transpods, eateries, like that; they never let 'em get a real inspection."

"Just get my card back," Sharayde mumbled dizzily. "I want to go home."

"We can take you, or you can wait here while we track Lenny

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Two. There's always the chance we'll get him in time. If not, you'll have to open a new account with a public declaration. Want to wait? You've had a busy day, Citizen."

The Medic, stowing her apparatus in her float, gave him a dazzling smile. So they'd looked him up when his number came in, found that he'd been honored just this morning. And was stupid enough to lose his card tonight.

Ben looked up, flushing, but the Deskman was already punching data on another call.

"I think you'd better wait," the Medic murmured. "You're very pale. There's no reason to hospitalize you, but it would be wise to rest."

* * *

He'd slept soundly enough, Ben thought when the Medic woke him. He'd been the room's only occupant; now many of the beds were full of groaning victims. He'd make sure not to be caught here again! It might even be wise to look for a job in a better district, much as he'd hate leaving Savin.

"We caught Lenny Two, and recovered your citicard, Mister Sharayde. Do you feel up to making formal identification now, so he can be disposed of?"

Ben nodded sleepily. "Of course. I'd just have to come back tomorrow if I didn't and miss a day's work. I feel a lot better." He followed the pretty medic through a safety door into a white room full of black-padded half-reclined armchairs lined up on their pedestals like mushrooms. Slouching, tattered nonregs, restrained by a single wristclamp, sat in the nearer rows, staring at them with blank defeated eyes.

On the far side of the room the chairs were smaller. Another Cop stalked over to intercept them, fingering his portacomp. (Interchangeable Cops in identical uniformed bodies, Ben thought dully. Are they bred in the Alwark Crèche, or do we buy them wholesale?)

"This the bastard that ripped you?"

Lenny Two lay loose and sensuous in the chair, one arm held by the wristclamp, the other limp across his lap. His clothing was in fragments. Damp dark hair framed his softened features, and his limbs were childishly slender.

"That's the boy, all right. But he looks a lot different."

The Cop snorted. "Should have seen him when they brought him in! Filthy, fighting, foulmouthed little biter! Had to sudje him before we could even clean him up and book him. Well, that'll take care of it, unless you want to. . ." he leered at Sharayde. "It's all right, you know."

Lenny Two raised half-open, seductive eyes.

"No, thanks," Sharayde stammered, astonished to realize he was

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blushing. "I thought sudje was illegal."

"Hospital has a use permit, naturally. They buy most of these kids as S-2 donors, so we start the process here. Makes 'em a lot easier to handle."

"You did recover my card?" Ben asked sharply, suddenly desperate to get away. (How potent was the sudje? Was the boy drugged beyond awareness?)

"It's at the desk. How's your hand?"

"Oh, fine. Which door. .?"

The Cop laughed harshly. "Tell 'em it still bothers you, get a free ride home. You aren't safe on the street this late."

* * *

Ben's promptcomp woke him with bright morning commercials; it was his one indulgence, aside from his location. (The Cop who drove him had been visibly impressed by his address: "If I lived here I'd never go wallside!")

A triple gong insisted he was late; the promptcomp must be running its program for the second time. Ben rested half-focused eyes on the holo filling the livingspace (the Cop should see how little room he could afford—much less luxuries) and gathered himself to rise. His eyes closed, and the gong rang again. He rolled onto his cut hand, groaned, and fell to the floor in a tangle of bedclothes.

No time to order a new suit to replace the one ripped last night; he paid a penalty for oversleeping. Nothing in his press looked right for the day. Well, dammit, when he wore good clothes he got ripped. The old gold with the oblique gray stripe was good enough for the domewall district, anyhow.

Wincing, he sealed his citicard into the breast pocket. He'd have to conceal the pain at work, or face a multitude of embarrassing questions; thank god the clips were nearly invisible. He dragged himself workwards.

Past the wallad blonde, who stretched langurously at his approach and licked her lower lip, murmuring "ONLY YOURS."

Two assignments jammed his slot: a thick and puzzling manuscript, and an undescribed full-page "Only Yours" dimenso to run in a glossy with heavy outcity circulation. Had Shebinoff fouled up the Only Yours account? He'd have to check.

Ben slouched in his chair and flipped through the manuscript, looking in vain for an explanatory note. How did Savin expect him to illustrate a thesis, and why? Especially since he couldn't even follow the argument? The author wrote an esoteric code, possibly clear to others in his discipline, but pure outish to Ben.

He shuffled the pages together and started again from the top, absently doodling as he read. The

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high-cheeked, long-eyed face of the wallad blonde smirked from his pad. If Only Yours was dissatisfied with that ad, he was going to be hard pressed to excel it; she had more than physical attractiveness, she promised confidences shared and a relationship built together.

Ben stripped the block, thinking of Cydra, the perfect receptacle, who listened to him with absorbing grace, while retaining nothing on the damaged plasm of her brain. He tried to imagine telling her of his misadventure of last night. She'd smile, and lean over for his kiss . . . no sense, just sensuality. . . Again he'd set lines in the plastop: Cydra's lovely, empty face, with the scornful blonde behind her, challenging him.

If Sheb had lost the account, it wasn't bright to copy him.

Until he could discover where Only Yours stood, he'd better work on the thesis, though it galled him not to understand it. Savin should have filled him in. Now he was left with only one alternative, distasteful but necessary.

Ben punched a callcode with angry jabs.

A pinched face filled his screen. "Taufry? Come over, will you?"

"Now? I'm busy, you fertile bastard." Delighted to get in a dig.

"C'mon, Tauf. I really need you. Just translate some math for me, and you can dig yourself back into your hole."

Will Taufry shrugged, bony hands high. "A minute, then. If you keep me, I'll bill you."

"No chance! Catch me letting you at my account!"

The screen died before Ben touched it; Paul Savin's resident genius must already be scuttling through studio corridors on tiny, deformed feet like a blood-drained spider somehow alive after mating.

Taufry would never be called to a bristening, though his semen was collected monthly just like everyone else's. Perhaps his defective genes were isolated in genetic processing, his brilliant mind and sharp, restless persona added to some embryonic karyotype, but he'd never know where, or if, his heritance continued.

For all his scolding, Will Taufry took his time studying the manuscript, scribbling notes and stripping them, tossing his scant hair by repeated thrusts of bony fingers. Finally he gathered the papers and rammed them carelessly back into the envelope.

"I'm going to have to keep these," he grumbled. "Might have known you'd come up with a time-waster."

"It wasn't my idea," Ben fended, upending his own brown curls in nervous imitation. "All I want is an explanation. It can't be much of an account, Savin didn't even put in a cover note. Probably just needs covers, for publication. But the chap writes some language all his own."

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"Your integrity is showing," Taufry teased. "You actually want your illustrations to relate to the text! You're right, though; this isn't aimed at the academic community, it's to be popularized, and the illos will have to be explanatory.

"On the surface it looks like an anti-genetic proposal. Ironic, to give it to a man who just bristened two babies! Well, I'll be glad to work on it. I'm pretty much in favor of natural selection, myself. I mean, we've got improved cattle and high-yield hens and protein-rich grain, not to mention oceanculture; with the world birthrate finally within the food-and-energy curve, we don't need to go artificial."

"We don't?" Sharayde looked meaningfully at the deformed feet.

Defiantly Taufry thrust out his surgical boots. "So we have a few accidents. It's a small price."

"To pay for what?"

"Serendipity, perhaps."

Taufry rose and smoothed his lilac skinsuit. "I'll get this back to you."

* * *

The wallad blonde kept intruding on his roughs; in disgust, Ben threw down the block and took up his sketchpad.

"That is without doubt the sexiest face I've ever seen," Karlyn Livonna murmured in his ear. "Boy or girl?" Paul Savin's personal secretary stood behind him, poised in her usual perfection of face and hair and dress.

"Is that why you weren't home last night? I tried to call you, Ben. Twice." She stepped away, perched one silken hip on his console, like a restless bird before flight.

When she'd approached him after the Alwark Open, he'd been dazed and flattered. Now he could only remember how she'd grown less and less approachable, how they'd failed to build anything meaningful between them.

"I finally got my cooking license. I wanted you to have a real dinner."

Then, circling like a hawk, "Who is that, anyhow?"

Ben stared down at his sketchbook. He'd drawn Lenny Two, nestled in the padded chair; the subtly exaggerated perspective emphasized the sudje-lost face, the helpless free hand curled palm up between the thighs. He'd meant to show the fierce, dangerous little bastard who'd ripped him, but that menace was from the Alwark streets. (And good riddance, Ben told himself sternly.)

"Boy or girl?" Karlyn repeated.

If he explained, he'd have to confess his stupidity of last night.

If he didn't, he risked alienating a woman who was not only a compassionate playmate, but a valuable asset; if he followed his instinctive resolve and left Savin, he might convince her to accompany him. With her help, he might even set up

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in business for himself—as long as he remembered how easily their relationship could twist to her advantage.

"You didn't come down to ask who my models are," he blurted, distracted by the soft curve of a leg sheathed in turquoise silk, the soft pads of her fingers upturned on his console in unconscious imitation of the hand in his sketch.

"No, of course not. Paul wants you to lunch with him and the Only Yours rep, since he's given you the account."

Ben gasped. Suddenly Karlyn was a distraction, keeping him from diving for the lav to check his shave and makeup, brush and spray his hair. Nothing he could do about the suit; why hadn't Paul warned him yesterday?

"What about tonight?" Karlyn pressed him. "I even caught a bit of sudje, Ben. Just for us."

His smile felt glued to his face, like a poorly assembled collage. "I'll call you, Karlyn," he mumbled. Then, viciously, "It was a boy."

Somewhere during lunch Sharayde's half-formed decision to leave Savin AdArt evaporated. Later, curled pensively over his sketchblock, he couldn't recall exactly what had changed his mind: being asked to plan the new campaign (Shebinoff wasn't consulted, though he still held the local account); the promised bonus; or the realization that he simply wasn't the businessman Paul Savin was, to maneuver people in Paul's subtle yet persuasive manner. It was almost as if he'd expected him to think of quitting. Thank god no one knew of the ripoff, or his plans; he had no embarrassing explanations to make.

And he had no bright ideas for the dimenso. This time he was expected to produce the entire proposal; the only thing he could think of was Sheb's blonde.

Replete from the excellent lunch—he'd eat like that every day, when the odd bonus became a fat salary—Ben slowly pulled out his sketchpads. Something there might give him an inspiration, though it was hard to guess what would sell the guided dream process in other cities, some of which disapproved of erotic stimulation during sleep, or any other time.

The campaign would have to be subtle.

Only Yours and EZSleep were subsidiaries of the same corporation. Could he suggest an aid for insomniacs? Or emphasize the sleepno learning process? Some of the most puritanical areas were big on education.

He certainly couldn't ask Taufry for more advice.

He had lots of good sketches, but nothing he could apply until he came up with the parameters of the campaign. The best was the one of the muscular black on the seawall, but he couldn't see how to tie it in.

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Maybe he was impatient to apply it, hoping to submit it for a prize.

Maybe he wanted to use it because it reflected his own erotic urges. But he'd just turned Karlyn down; he surely didn't want a synthetic substitute!

On his way home, he carefully notwatched the wall. When he arrived he learned that a bash had been announced on the floor above his apartment; with his painful hand, carelessly overused throughout the day, Ben decided not to attend, though for some reason it attracted him more than such affairs usually did.

Cydra was booked for the evening.

Lenny's sudjed, sensuous face came between himself and Karlyn.

He turned from the fonescreen, and the promptcomp raised the volume. A five-minute minidrama for Only Yours pranced through his room: the wallad blonde, arm-in-arm with a tall black girl, called invitingly to a shadowy person not yet onstage.

Ben flashed a station change, hoping that Only Yours hadn't bought saturation. They had. He cut off the holovee, telling himself that once he had the campaign under control the porno would no longer disturb him.

He had trouble falling asleep.

His unremembered dreams were unpleasantly frustrating.

He woke angry with himself; why was he so suggestible? He needed a woman; more than that, he needed a sympathetic ear. If Cydra didn't satisfy him, why should he imagine that a programmed dream would? Perhaps his rejection of Karlyn was symptomatic: he couldn't stand her domination; offering him sudje simply showed she controlled the relationship. Maybe women had their own needs and interests, but he didn't want to get involved in that.

No wonder a sleepno seemed attractive.

* * *

The cornrowed black, mouth slightly open, eyes eager, was once again planted under the wallad as Sharayde passed. The sultry voice included him: "ONLY YOURS, lover. . .dream with me tonight. . .I'm Suzi, program 63B. . .ONLY YOURS, lover. . ."

Ben stopped.

"Duck off!" the black growled. Muscles bunched in cheeks and biceps. "Stick to your own kind, heah?"

Startled, Ben stepped back. A great hand jammed his shoulder bones together, lifting him almost off his feet. For a second he saw the wall as the taller man did: a statuesque black girl, full breasted, full hipped, fertile as a moongoddess, the girl who walked with his blonde, turning to tease him. . .

"Your pardon, Citizen. If you would look through my eyes a mo-

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ment, you'd see this is a height-oriented display." How calm he sounded!

"Huh?" The man swung back, his fingers loosened a fraction, and Sharayde ducked away, shaking.

He didn't want to see the inside of a stationhouse again.

Neither did he want to arrive at work obviously upset.

He wanted to rent an Only Yours. He'd never tried the combination of hypnosis and sensory stimulation that induced controlled dreaming; perhaps his lack of personal experience was keeping him from creating the campaign.

It wasn't addictive, he reminded himself. The process gave only general guidance; each dreamer added elements from his own subconscious. He could dream a Suzi whose emotional needs would coincide with his.

And he could charge the initial setup cost to Savin AdArt as research expense!

Resolutely he bucked the crowd under the wallad. "ONLY YOURS," she whispered.

"Damn right," he answered aloud.

Early sleepno models had required electrodes attached to neck and scalp; these now were incorporated in a long-sleeved, high-necked sleepsuit which permitted unrestricted movement while transmitting minute impulses to the peripheral nervous system when the REMs of dreaming sleep were picked up by the projector mounted by the bed.

Ben had expected to feel relaxed and confident after the hypno session, but he only succeeded in achieving a state of acute anxiety as he paced the floor in his sleepsuit, as instructed, to mold it to his body. Already he could hardly feel it, but it was hard to believe that the rest of the program would work as well.

Even Suzi's face seemed dim and distant. He could recall nothing of the introductory dream. Why hadn't they removed his nervousness under hypnosis? They'd had him under long enough. Rental and set-up had taken the whole day.

Now he was simply stalling, notwatching the holovee rather than committing himself to bed.

The unit, warmed up and ready, emitted a slight, soporific hum.

Ben's hands shook as he pulled back the covers . . .

* * *

Golden tanned, with the tang of seasalt on her skin, Suzi slipped into his arms. With slow rolling combers tickling their feet, she listened, entranced, as Ben Sharayde spoke.

Then they were in his studio, and he showed her drawings he had withheld from Savin as too self-revelatory. Empathically, she understood them. As they responded to each other, he vaguely remembered

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that sleepsuit filaments were impinging on his nervous system, routing preplanned feedback, then ignored it. Carried to peaks beyond previous experience, they achieved an intimacy he had never known.

Half-waking, lazily anxious to keep remnants of the dream, he thought: what would our child be like, our natural child?

Genetically unprogrammed, it wouldn't be accepted by the Crèche. He could sponsor it for training, but the chance that it would earn employment and citizenship would be slim.

Every child deserved a perfect birthright. He thought grimly of Will Taufry, who must have been among the last of the naturally conceived. No child of his should suffer such deformity!

The promptcomp chimed, building a morning snapper. Time to get up; and now he knew how to handle the Only Yours campaign.

Taufry waited for him in his studio, the thesis on his lap. Ben cut off his eager flow of explanation, while his stylo flew over the plastop. The layout grew in a spill of color.

"There! Like it?"

"Not bad. But you didn't ask me to critique a porno. Where were you yesterday? Never mind.

"This thesis is more than a technical paper. It's a congressional proposal; the author doesn't care if the illos are appropriate, he just wants it noticed. Then he can come on strong in committee.

"This is big, Ben. And scary. Remember the Crisis of '38?"

"Something to do with food, I think."

"You were still in Crèche, I suppose. It was a world famine. Any idea what caused it?"

Ben ran his fingers over the plastop, impatient to transfer the sketch to permablock and add emoting. How could a thirty-year-past famine reflect the present? There hadn't been one since; obviously, the cause had been corrected. He said as much, grunting.

"Pay attention, Ben. It started with a triticale rust, a mutation of an old disease that wasn't even supposed to affect the mutant hybrids. Then a mosaic started on potatoes, and something else took the corn crop. All at once. So we had a crisis. Because those diseases didn't just affect a field or two, Ben. No, our agriculture has developed strains so high-yielding, so disease-resistant, so easy to weed and fertilize, that almost every farmer in the temperate latitudes plants the same seed. Anything that infects that strain simply gallops around the world. And then the experts have to breed resistant strains, and there's the catch. None of the old, tough, low-yield stuff is still around. There's no way of guessing how many varieties were permanently lost by our modern advertising and distributing system, not to mention the idiotic use of land for housing

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before Contract complexes were built.

"The rust was beyond chemical control. I know, my family are farmers; I saw those fields. You just can't imagine, mile after mile of drooping stalks, with the half-ripe heads in the dust, and the shining green-gold turning a miserable brick color.

My oldest brother's planting mutated seed in the same fields, now, mile after mile of triticale-173. And some day something'll take out that strain, and they'll have to start over . . .

"Maybe I didn't make it clear. They had to mutate by radiation, discarding about a million lethals in the process, because there wasn't a naturally rust-resistant strain left. Triticale was an artifically forced hybrid, originally, you know; but even the parent strains were largely lost. So they developed a resistant strain; and found it too weak-stalked to harvest; and nothing to breed it back to, until they uncovered some grass—in Africa, I think—and forced another genetic match. And there was the same struggle with corn and potatoes, while the world slowly starved." Taufry heaved himself out of the chair and paced, his face haggard.

Ben shook his head sympathetically, his visually oriented imagination a tangle of fallen grain and rusting farm machinery. "But what's all that got to do with this thesis? I can't understand much of it, but it hasn't a word about field crops."

"True. I'm trying to give you the background. Help you understand what happens when the gene pool of any species is censored too drastically.

"Ben, you have children."

Sharayde stared at the little man. "You know I do."

"And you assume that I don't. Only healthy, registered Citizens can contribute heritance. Unregs have kids, who run the streets on their parents' dole, but they'll never be used as donors. And their progeny are allowed to starve."

"Well, there's the quota . . ."

"Ah, the quota. That lets some of those children into school, if they're sponsored, or otherwise qualify. If you should sire a careless child, Ben, you might even be moved to sponsor it yourself, publicity be damned."

(With Suzi, if there really was a Suzi. Tauf had a point.)

"Do you see what I'm driving at, Ben?"

Sharayde rubbed his forehead, where a gentle pulse promised the father and mother of a migraine to come. He poured some water and took a pill. If Taufry had something to say, why didn't he come right out and say it?

"Tauf, I'm not feeling well, and Savin's looking for this layout. Suppose we discuss this again tomorrow?"

Taufry tossed the envelope onto

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his console and drew himself up like an offended billy goat. His crest of upended hair as tall as he could manage, he clopped out.

Ben felt momentary guilt. He'd interrupted whatever Taufry'd been working on, and then hadn't even listened to his results. But he had to complete the outline before his headache got beyond the point where medication would hold it. He took up the permablock and began to work. The day somehow passed . . .

* * *

A second pill made him drowsy; he fell into bed, hardly noticing the sleepsuit that now covered him like a second skin.

They met under a blue-white sky; his headache vanished at the very sight of her sweetly curved body.

She clung to him silently in a gently rippling ocean of ripening grain, and there was nothing he needed to say to her, nothing for her to explain to him; she opened herself and he plowed into her, trying to plant reality in her eager acceptance, his eyes level with broken, copper-smeared stalks.

* * *

Savin was pleased with the layout, and sent it to a wordsmith for polishing. It would be days before Ben had to produce a finished plate; he took up the thesis, drawing angular clumps of dying grain as he studied Taufry's notes.

Taufry spotted them at once.

"You've got it!" he yelped. "Now put in some human skeletons."

"This?" Ben gave it full attention. "I was just doodling. . .I dreamed about it last night, dammit."

"Good. You've got to scare hell out of them."

"Me? Scare who? Come off it, Tauf."

"You. Out of us. I've put it together, Ben; limited genetic selection, combined with the S-2 process."

"The what?"

"The process that invalidates the DNA immune-response triggers to create universal donors. You know they can transplant any body part now, without subjecting the recipient to anti-rejection treatments. Don't look so blank, Ben! You must know what I mean!"

Ben, whose mind had suddenly flashed back to Lenny Two, nodded. "I'd meant to ask you, Tauf, why you never had your feet fixed, now that the donor bank is cost-effective."

"I was going to," Will Taufry's normally pale face turned slightly green, and his eyes glazed. "I even went up and inquired about it.

"But I made one mistake. I asked to see the donors." A shudder whipped through his body. "A doctor took me down to a room full

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of kids—S-2 works best on adolescents—in restraints, naked, drugged mindless—waiting like patient animals to be carved up and portioned out for sale. Most of them were already missing bits here and there, an eye, a leg, hunks of muscle and skin, and all of them were bald; hair transplants were very big that year.

"I got sick on the spot. Embarrassed the doctor terribly. He probably bent the rules, taking me down at all, but he knew I was in advertising, he was very p.r. conscious. . .well, of course I couldn't go through with it. God knows what I'll do if I ever *need* a donation; I'm not sure I could accept one now even to save my life."

"That's silly. You said yourself they were mindless."

"I know. The child whose feet I was buying was already destroyed. But I *saw* them, Ben."

"The City is better off without them. I ran into one—he ripped me off—nasty, vicious little bastard!—I was glad when I saw him sudjed and ready for processing. For once he was an asset, not a liability."

"He was nasty, dirty, and vicious because he didn't have a chance to be anything else. He must have been clever or he'd never have caught you. Don't you see that as a waste?"

"*No*!" But Ben swallowed sickly, trying not to visualize Lenny Two in fragments.

"What we're doing is fishing the gene pool from both ends," Taufry continued relentlessly. "Genetic selection on the one hand, and removal of unplanned, possibly serendipitous genes among the unregistered.

"Naturally there's a big demand for S-2 donors; someday they may take kids right out of the Crèche, if they're slightly unsatisfactory. Transplants earn Alwark a lot of money, and it's humanitarian, besides. And there's no protection for the kids.

"Oh, we're pragmatists. Better to save a productive Citizen than some unknown quantity, like a child. But someday we'll limit our selection just a little too much by putting a dollars-and-cents value on the gene pool."

"You're expecting a people rot, Tauf?" Ben tried to laugh.

"Why not?"

"God, what a pessimist!"

"I'm not the only one." Taufry tapped the thesis significantly.

"We don't need the unregs," Ben argued. "We can always swap a few vials of semen somewhere, spread the old genes around."

"We already have; man's a traveler, and he's left souvenirs wherever he goes. The rest of the world is imitating our success, here. Oh, it won't happen tomorrow. We haven't the faintest idea when or whether we eliminate a trait we will need someday; we don't even know what the trait is. Maybe there's something linked to defective feet

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that could save the world, some day. Maybe something goes with albinism, or schizophrenia.

"This proposes legal protection for all minors, and removal of the stigma on natural birth."

"That would practically wipe out the donor program. Surely there's no need to go that far!"

"It would at least make it uneconomical," Taufry agreed.

"But there's billions of people, uncounted combinations of genes . . ."

"That's true. But there was lots of grass, too; it just happened to all be the wrong type."

"Geneticists plan for all this. They have to."

"If they consider it at all, how can they extrapolate unknown needs?"

"Analog computers . . ."

"Can only run what's fed into them."

Ben sighed. "Suppose you convince me. What can I do?"

"Beside illustrate this the best you can? Dunno, Ben. But the chap who sent it here is right. If he's going to attract attention, he's got to start with advertising. With us."

"That's too much!"

"Too much responsibility? Maybe so. Every once in a while something like this comes along, something quiet and frightening, with a choice attached. If I hadn't seen it, you'd never have known what you were working on. And no one will ever know if you duck the responsibility, either. But if you can get that feeling," he gestured towards the dying stalks in Ben's sketch, "in your illustration, you may just possibly save the future. . .if you want to."

"Why did it come to me?" Ben groaned. "Anyhow," he went on more calmly, "how do I know you know what you're talking about? You've got a twist on genetics, stands to reason. You're probably blowing this out of all proportion."

"Wouldn't it be nice if I were?"

By the end of the day, Ben had sketches that would fittingly illustrate Dante's *Inferno*, but none of them would dent the conditioned consciousness of his world like the quiet desperation implicit in the dead grain.

It didn't make sense, anyhow. Nothing could be that simple. It didn't stand to reason that a single concept really stood with its finger in the dyke that way.

But he didn't want to dream that night, not after the grainfield; he didn't want to meet her there, or in an operating room where children were sectioned into living prosthetics, or a laboratory where gene selectors chose the future of the human race . . .

* * *

He fell asleep in his chair as the promptcomp softly spun commercials through his livingspace.

He dreamed he was explaining the illustrated thesis to Savin,

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fidgeting as he hadn't done in years. "I don't understand why you've used so much emotion," Savin shook his leonine head mildly. A mild Savin was dangerous.

"This is serious, Paul." Better not admit that Taufry had done his thinking for him. "I'm really convinced of that." (Am I: Am I really?)

"Look at it this way," Savin replied smoothly, tossing blonde locks as he reached for a stylo. "The kids are better off as donors than dying in the streets; they're fed and housed and cared for."

"Just like animals."

"Useful animals. You sound like a radical idealist, Ben. Suppose you got wiped in a street fight, or developed cancer. You're a valuable Citizen; would you trade your future for some bastard raiding garbage pickups?" Suddenly it was Suzi staring at him from Savin's chair.

Ben shifted uncomfortably. "I'd want to be cured, of course. But it isn't right . . ."

"How about me, Ben? Or our child?"

"What if he was donated, instead?" Ben's gut tightened painfully. The child he had vaguely imagined now seemed very real and dear.

"He wouldn't be. Ben, you're fighting progress. Why, with the donor program, a valuable man like you could live almost forever." Suzi rose and came round the console to lay a burning hand on his chest.

Ben looked down at himself: a cobbled, patched old corpus split from collarbone to crotch, stuffed with assorted organs, all tagged with the donors' names. Suzi's hand held a pulsing young heart; Ben knew it came from Lenny Two. He slapped at the wound, too late; the heart was already his . . .

"You've invaded me!"

"Ah, Ben, I'm one with you." He could no longer see her; she had faded into the flickering holoimage. Some dream this was! He should get his money back! But—

"Hey! I'm not sleepno'd!" he shouted, lunging forward, falling stiff and chilled from his chair.

The promptcomp, sensing his awakening, built a too-familiar commercial, line by dimensioned line.

"Cut!" he screamed. It blinked off.

Huddled on the floor, Sharayde wept.

* * *

Ben slumped at his console, nibbling the end of his stylo. The triticale, viciously stylized, was transferred to permablock. Against a snowy background the only colors slashed rust and black, the only emotion despair. If he released it with the thesis, people would remember the famine of '38; a crooked stem, a structured clod of

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earth, twined the numbers through the design.

Did he really want the thesis to attract this much attention? Without flattering himself, Ben knew that the art was extraordinarily good. He'd come too far to compromise; either he used this, or refused the commission entirely.

Never before had he come to the point where he had to say, here is my work, take it or leave it; advertising is not kind to inflexible integrities.

The Famine of '38 formed the cover. The interior format was simple, compensating for the complex text: a child graced the margin of each page, hopeful expectation suggested in plain outline. On the endpaper a blue-green globe, cloud-covered and serene, too distant to prove the presence of man, floated in a paperwhite forever.

The morals involved were too complex to resolve, but he'd worked too hard, given too much of himself, to waste the illos.

Ben racked up the finished thesis and chuted it to Savin's office, then drew out his next assignment: tinted corneal lenses with fluorescent seductionlines shimmering across them. Probably bad for the vision, he thought, but merchandisable. He could finish it quickly, and stop by Only Yours for a new dream; he had to get 63B out of his mind.

Reversing the gnawed stylo, he began to sketch Cydra, totally takable, with wide fluorescent eyes. ★

THE WALLAD BLONDE -

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THIS IS ALTER-EGO speaking. Jim Baen has just called and asked to have me and Geis write another column.

Geis went into a blue funk and has refused to have anything to do with it. Correctly, he realizes that when the previous column is published this Fall and you readers vote on who is to be primary in this column—me or Geis—he will lose.

"I will *not* lose, Alter! I am not in a blue funk. God, how you lie and misrepresent! I merely went upstairs to make a phone call and come back to find you starting this column without me. I shudder to think what would have happened if I'd called my friend, Jim Rise—"

He's the guy who can talk the trunk off an elephant, isn't he?

"Well, Jim does find an hour to be a trifle short as far as a conversation goes, but—"

Call him, Geis. Let me alone to do the work around here. Go soak in a hot tub. Go out and putter in your garden. Pull a few thousand weeds. Talk to the strawberries. Murmur sweet nothings to the corn stalks. Mutter dire threats to the peach tree that failed to bear this year.

"I will sit here and watch what you type with my fingers, Alter. I will keep a mental finger on the override buttons and a hand near the blue pencil."

Killjoy!

"Yes. Admitted. Now, let's see you attend to something Jim wanted, namely explain how come

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your predictions in the May issue have gone sour."

Sour? *Sour?* The only predictions I made that haven't come true are the first ones—the political ones, and they were made way back in February, 1976, before the primaries had even begun.

"Alter, you predicted, and I quote: '*1976: Ford loses to Reagan in nomination battle. Wallace health becomes a factor. Jimmy Carter beneficiary of big media buildup to challenge Wallace. Ted Kennedy accepts nomination, beats Reagan. Inflation hits 12—15% in later months of 1976. Unemployment till 8% plus.*' Care to explain how you missed on Carter/Kennedy?"

First, Geis, let me make it clear to the readers that at the moment Reagan and Ford are neck and neck; Reagan could still unseat Ford. [*Perhaps Alter will explain that next time. Ed.*]

George Wallace's health *did* become a factor in his campaign; the stories of his paralysis and wheel chair life that kept appearing on TV doomed him. The voters saw him as not physically fit to be president.

That helped sink Wallace, and the Stop-Wallace urgency by the leaders of the Democratic party also caused them to pass the Word to boost Jimmy Carter.

Jimmy Carter *knew* the big liberal Demos would want a good, safe Southerner to use against the evil Wallace. He presented himself and got their support. Only thing is, he

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has charisma and cunning and a keen nose for the wind of public disenchantment, and he quickly got himself a ton of publicity and a big bagfull of delegates before the king-makers and power-brokers knew what had hit them. You saw what happened: they turned desperately to Humphrey, Church, and finally Brown to try to stop this grinning monster they had created—too late. They were trying to get Kennedy at the last minute, too, but . . .

I still think the plan was for a deadlocked convention to turn to Kennedy. But Carter ran with that anti-establishment reformer theme and the people bought it. So now the Demo leaders must live with Carter, grumpily on the inside, and with sweetness and unity on the outside. We're in for a succession of 'maverick' presidents, I think.

"You squirm pretty good, Alter, but you were still wrong."

Not by much, Geis, and I could

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still be right about Reagan. And I'll betcha I'm not far wrong on my 12–15% inflation rate by year's end, with unemployment around 8%.

"Fat chance—let's drop it for now. Let's turn to—"

Geis, I have a grotch I want to ungrotch. I want to—

"Don't be obscene, Alter, We can't—"

For your low level of perception, Geis, I will speak in ultra-square words: I have a complaint.

"Another complaint? That's all I hear from now; the food is too ripe—"

'Rotten' is the word.

"The dungeon is too cool—"

Cold, damp, moldy and drippy.

"Or the lighting is less than ideal."

One naked forty watt bulb is not even sufferable. But my complaint this time is about an aspect of science fiction that bugs me, and that is slowly driving me up the slippery stone walls.

Sigh "Another diatribe. What is it this time?"

I am tired unto vomiting-up-my-swill of the old formula-based, pulp-born, laziness-continued habit of science fiction writers that impels them to lean on the old rule of fiction writing that goes something like this: Up the Stakes.

"I'm afraid, Alter . . ."

Don't you understand? The surest, simplest, *easiest* way to make sure readers are hooked and stay hooked into an sf story, especially a novel, is to up the stakes—so that the fate of all Mankind or the planet or the solar system, or the galaxy or even the whole damn universe is at stake when the hero fights the baddies.

"Well, sure . . . that's traditional."

That's goat guano, Geis. It's almost always a signal the author is incompetent, feels himself to be a weak writer, or is too lazy to struggle through to a level of plotting and characterization where such pitiful narrative crutches aren't necessary.

"Now, Alter, you paint with too wide a brush. Are you saying such writers as Larry Niven, Roger Zelazny, to name but a few good ones, are bad writers?"

No, they're good writers, but they're trapped in bad habits left over from the pulp days. With them the End of the World/Race/Galaxy/Universe formula is gilding the lily. They . . . and a dozen or so other really good-to-excellent sf and fantasy writers . . . don't need to rely on the old high stakes gimmick to hold their readers and tell a good, memorable story. But over and over, year after year, they all seem to construct stories that involve the Ultimate Doom unless . . .

"But, Alter, the readers like high stakes sf. Why not give them what they like?"

They like good, well-told, tightly

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structured, suspenseful stories. And all I'm saying is that this Ultimate Threat device of sf story-telling is running on its rims. It has been used to death.

"But—"

But nothing. Look at the other genres. Look at Westerns. When the hero blasts the hired gun the fate of all civilization doesn't depend on that fast draw. All that's at stake is one life, maybe a mortgage, and the love of his girl and his horse.

"His *horse*?"

Dog? Never mind. Look at the Gothics. All that's on the line is a lady's honor and maybe her life, which ever comes first. Also some love, I guess. Nothing cataclysmic.

"Alter, I have spotted a chink in your armor."

Nonsense, Geis. Nobody would believe a Chinese with spots. Now, take mysteries and detectives; do they require that the life and death of whole peoples, species and galactic cultures hang in the balance when the evil person who-dun-it is in the final face-down with the forces of Good? NO!

"Alter, are you saying that all these other genres of fiction are better plotted and better characterized than Science Fiction stories and characters?"

Oh. The chink?

"The chink. I have thrust my verbal sword into your vitals."

Hmm. No, I don't claim that at all. All I said was that it is too easy to rely on the old reliable sf most-dreadful-is-better gestalt to buttress a story's interest potential. Plus there is that aspect called Sense of Wonder, and the *other* easy-way-out (to success and riches) of escalating a locale or a machine or a space ship to *gigantic* size to impress and awe the reader. It may be part of the American character at work, in that sense. The appeal is there. Using these guidelines, the ultimate sf novel would be about a 3000 foot alien frozen in a thousand mile long derelict spaceship which has been trapped in a galaxy-sized space-warp for six billion years, and if the hero doesn't unwarp the warp and fix the spaceship and wake the alien within six days and thirty-three and a half minutes, the ENTIRE UNIVERSE will go nova and kill off God.

"Alter, you're a genius! Let me take some notes. What would be a catchy title?"

Geis! Damnit! I was mocking, exaggerating, satirizing to prove my point.

"I know, but it's a good plot! Give me a title. I'll hack out an outline, a chapter or two, and I'll be rich!"

How about THE GOOGOLPLEX MAN?

"Yeeees . . . I like it!"

I hate it. No, I don't hate it. I'd like it, but I'd hate myself in the morning for liking it, if somebody with talent wrote it. Not you, Geis.

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You see, Geis, it can be done. Fascinating, gripping science fiction can be written in a narrow focus, small scale and low budget, so to speak.

"But science fiction readers have been spoiled; we've grown accustomed to the pace. We need our high-stakes novels. Look at the computers that take over the world, the disease that will wipe out all people, the natural disaster that threatens extinction to all mankind . . . That's heady stuff. It's like a drug . . . and we require ever-greater disasters, ever huger spaces and deeds and effects to get our rockets off."

Exactly, Geis. You make my point. I say we've about reached the end of the road, the well is dry and the bottom of the High Stakes and Wonders barrel is staring us in the face.

"You do coin a phrase, Alter. And I guess I'll have to agree. It *is* time we sf writers consciously considered giving up the over-reliance on the Big Scene and spent more time and effort on more believable future problems handled by more believable future people."

Sure. Look at TV. "The Waltons" don't have to solve murders or perform brain surgery every week to maintain viewer interest. They give us sympathetic people struggling with personal and family problems during hard times. Top-rated show. Very good characterization and acting, and writing.

"Wow, Alter. You really think a future-fiction novel like that would have a chance . . . would get published?"

It better. A lot of sf readers are getting awfully sick and tired of the diet of unending to-the-limit stuff they've been fed for 50 years. That's partly why most sf readers give up on the genre after an early enthusiasm when young—they get unconsciously bored. Jaded. Give them real future people with real future problems on a believable scale, and they'd stick with us for a long time.

"Maybe you're right, Alter. But that 3000 foot alien in that thousand mile long derelict spaceship intrigues me."

Bah, you're hopeless! Get out of my dungeon! Leave me alone.

"What are you going to do—sulk? Just because—"

Geis, you're a superannuated juvenile. You never matured beyond the age of thirteen.

"Fifteen! And proud of it! Nobody likes a superior, insulting, patronizing, arrogant alter-ego, Alter."

Geis . . . just . . . leave.

"All right, all right, I'm going. Just don't think you're ever going to take over this column. The readers will vote for one of their kind, not some lousy creature with evil thoughts and . . . and . . . *tendrils!*"

OUT!

SLAM

★

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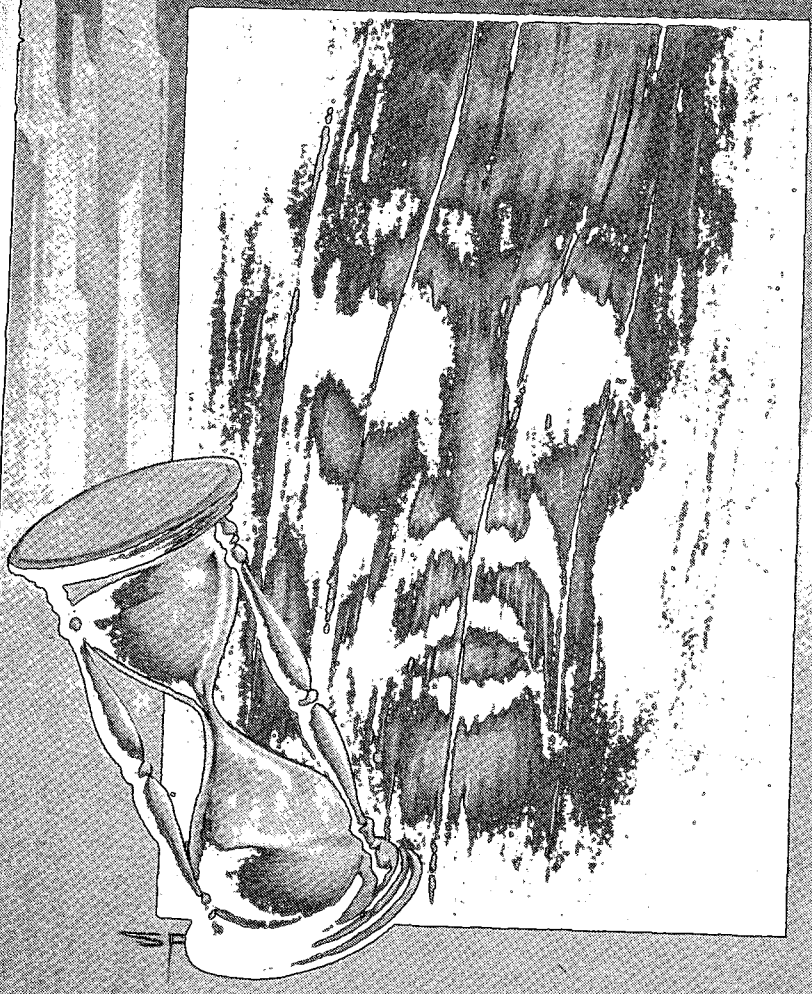
NO RENEWAL

by Spider Robinson



Of the many kinds of tyranny, perhaps the most cruel is that of the majority.

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DOUGLAS BENT JR. SITS in his kitchen, waiting for his tea to heat. It is May 12, his birthday, and he has prepared wintergreen tea. Douglas allows himself this extravagance because he knows he will receive no birthday present from anyone but himself. By a trick of Time and timing, he has outlived all his friends, all his relatives. The concept of neighborliness, too, has predeceased him; not because he has none, but because he has too many.

His may be, for all he knows, the last small farm in Nova Scotia, and it is bordered on three sides by vast mined-out clay pits, gaping concentric cavities whose inside were scraped out and eaten long ago, their husk thrown away to rot. On the remaining perimeter is an apartment-hive, packed with ant-like swarms of people. Douglas knows none of them as individuals; at times, he doubts the trick is possible.

Once Douglas's family owned hundreds of acres along what was then called simply The Shore Road; once the Bent spread ran from the Bay of Fundy itself back over the peak of the great North Mountain, included a sawmill, rushing streams, hundreds of thousands of trees, and acre after acre of pasture and hay and rich farmland; once the Bents were one of the best-known families from Annapolis Royal to Bridgetown, their livestock the envy of the entire Annapolis Valley.

Then the petrochemical industry died of thirst. With it, of course, went the plastics industry. Clay suddenly became an essential substitute—and the Annapolis Valley is mostly clay.

Now the Shore Road is the Fundy Trail, six lanes of high-speed traffic; the Bent spread is fourteen acres on the most inaccessible part of the Mountain; the sawmill has been replaced by the industrial park that ate the clay; the pasture and the streams and the farmland have been disemboweled or paved over; all the Bents save Douglas Jr. are dead or moved to the cities; and no one now living in the Valley has ever seen a live cow, pig, duck, goat or chicken, let alone envied them. Agribusiness has destroyed agriculture, and synthoprotein feeds (some of) the world. Douglas grows only what crops replenish themselves, feeds only himself.

He sits waiting for the water to boil, curses for the millionth time the solar-powered electric stove that supplanted the family's woodburner when firewood became impossible to obtain. Electric stoves take too long to heat, call for no tending, perform their task with impersonal callousness. They do not warm a room.

* * *

Douglas's gnarled fingers idly sort through the wintergreen he picked this morning, spurn the jar of sugar that stands nearby. All his

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life, Douglas has made wintergreen tea from fresh maple sap, which requires no sweetening. But this spring he journeyed with drill and hammer and tap and bucket to his only remaining maple tree, and found it dead. He has bought maple-flavored sugar for this birthday tea, but he knows it will not be the same. Then again, next spring he may find no wintergreen.

So *many* old familiar friends have failed to reappear in their season lately—the deer moss has gone wherever the hell the deer went to, crows no longer raid the compost heap, even the lupens have decreased in number and in brilliance. The soil, perhaps made self-conscious by its conspicuous isolation, no longer bursts with life.

Douglas realizes that his own sap no longer runs in the spring, that the walls of his house ring with no voice save his own. If a farm surrounded by wasteland cannot survive, how then shall a man? *It is my birthday*, he thinks, *how old am I today*?

He cannot remember.

He looks up at the goddamelectricclock (the family's two-hundred-year-old cuckoo clock, being wood, did not survive the Panic Winter of '94), reads the date from its face (there are no longer trees to spare for fripperies like paper calendars), sits back with a grunt. *2049, like I thought, but when was I born?*

So many things have changed in Douglas's lifetime, so many of Life's familiar immutable aspects gone forever. The Danielses to the east died childless: their land now holds a sewage treatment plant. On the west the creeping border of Annapolis Royal has eaten the land up, excreting concrete and steel and far too many people as it went. Annapolis is now as choked as New York City was in Douglas's father's day. Economic helplessness has driven Douglas back up the North Mountain, step by inexorable step, and the profits (he winces at the word) that he reaped from selling off his land parcel by parcel (as, in his youth, he bought it from his ancestors) have been eaten away by the rising cost of living. Here, on his last fourteen acres, in the two-story house he built with his own hands and by Jesus *wood*, Douglas Bent Jr. has made his last stand.

* * *

He questions his body as his father taught him to do, is told in reply that he has at least ten or twenty more years of life left. *How old am I*? he wonders again, *forty-five? Fifty? More?* He has simply lost track, for the years do not mean what they did. It matters little; though he may have vitality for twenty years more, he has money for no more than five. Less, if the new tax laws penalizing old age are pushed through in Halifax.

The water has begun to boil.

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Douglas places wintergreen and sugar in the earthenware mug his mother made (back when clay was dug out of the backyard with a shovel), removes the pot from the stove, and pours. His nostrils test the aroma; to his dismay, the fake smells genuine. Sighing from his belly, he moves to the rocking chair by the kitchen window, places the mug on the sill, and sits down to watch another sunset. From here Douglas can see the Bay, when the wind is right and the smoke from the industrial park does not come between. Even then, he can no longer see the far shores of New Brunswick, for the air is thicker than when Douglas was a child.

The goddamclock hums, the mug steams. The winds are from the north—a cold night is coming, and tomorrow may be one of the improbable "Bay-steamer" days with which Nova Scotia salts its spring. It does not matter to Douglas: his solar heating is far too efficient. His gaze wanders down the access road which leads to the highway; it curves downhill and left and disappears behind the birch and alders and pine that line it for a half-mile from the house. If Douglas looks at the road right, he can sometimes convince himself that around the bend are not strip-mining shells and brick apartment-hives but arable land, waving grain, and the world he once knew. Fields and yaller dogs and grazing goats and spring mud and tractors and barns and goat-berries like stockpiles of B-B shot . . .

* * *

Douglas's mind wanders a lot these days. It has been a long time since he enjoyed thinking, and so he had lost the habit. It has been a long time since he had anyone with whom to share his thoughts, and so he has lost the inclination. It has been a long time since he understood the world well enough to think about it, and so he has lost the ability.

Douglas sits and rocks and sips his tea, spilling it down the front of his beard and failing to notice. *How old am I?* he thinks for the third time, and summons enough will to try and find out. Rising from the rocker with an effort, he walks on weary wiry legs to the living room, climbs the stairs to the attic, pausing halfway to rest.

My father was sixty-one he recalls as he sits, wheezing, *when he accepted euthanasia. Surely I am not that old. What keeps me alive?*

He has no answer.

When he reaches the attic, Douglas spends fifteen minutes in locating the ancient trunk in which Bent family records are kept. They are minutes well-spent: Douglas is cheered by many of the antiques he must shift to get at the trunk. Here is the potter's wheel his mother worked; there the head of the axe

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with which he once took off his right big toe; over in the corner a battered peavey from the long-gone sawmill days. They remind him of a childhood when life still made sense, and bring a smile to his grizzled features. It does not stay long.

Opening the trunk presents difficulties—it is locked, and Douglas cannot remember where he put the key. He has not seen it for many years, or the trunk for that matter. Finally he gives up, smashes the old lock with the peavey, and levers up the lid (the Bents have always learned leverage as they got old, working efficiently long after strength has gone). It opens with a shriek, hinges protesting their shattered sleep.

* * *

The past leaps out at him like the woes of the world from Pandora's Box. On top of the pile is a picture of Douglas's parents, Douglas Sr. and Sarah, smiling on their wedding day, Grandfather Lester behind them near an enormous barn, grazing cattle visible in the background.

Beneath the picture he finds a collection of receipts for paid grain-bills, remembers the days when food was cheap enough to feed animals, and there were animals to be fed. Digging deeper, he comes across canceled checks, insurance policies, tax records, a collection of report cards and letters wrapped in ribbon. Douglas pulls up short at the hand-made rosary he gave his mother for her fifteenth anniversary, and wonders if either of them still believed in God even then. Again, it is hard to remember.

At last he locates his birth certificate. He stands, groaning with the ache in his calves and knees, and threads his way through the crowded attic to the west window, where the light from the setting sun is sufficient to read the fading document. He seats himself on the shell of a television that has not worked since he was a boy, holds the paper close to his face and squints.

"May 12, 1989," reads the date at the top.

Why, I'm fifty years old he tells himself in wonderment. *Fifty; I'll be damned.*

There is something about the number that rings a bell in Douglas's tired old mind, something he can't quite recall about what it means to be fifty years old. He squints at the birth certificate again.

And there on the last line, he sees it, sees what he had almost forgotten, and realizes that he was wrong—he will be getting a birthday present today after all.

For the bottom line of his birth-certificate says, simply and blessedly, ". . . expiry date: May 12, 2049."

Downstairs, for the first time in years, there is a knock at the door. ☆

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DIRECTIONS

Dear Mr. Baen:

Two stories in the September 1976 issue deserve comment. "Abandon all Heat—" (to use the short title) is not only a gem, but clearly, without saying so, it reveals the secret of entropy itself. Not just the introduction of disorder, that was stated, but the energy-loss at each transaction (described as a gate in a black box). *Hell is the other half of the box,* and a toll of energy from each transaction in our universe is directed through to keep Hell hot.

I should have known, being one of the small group of anthropologists who describe social power and organizational relationships in terms of relative entropy and energy-flow.

Which brings me to Nocka Nocka in "The Dirty Old Man." While anthropologists such as those depicted there (the chances are overwhelming that a linguist knowing *any* Calusa would be an anthropological linguist) are not unknown (in fact Tarantella is very reminiscent of one of the legendary pioneer ethnologists), the percentage has always been low and in this generation is almost zero. All I've got to say is that Nocka Nocka is just lucky they weren't archaeologists. He'd have starved.

As to Vine De Loria, he is an anthropologist himself. He is very highly regarded in the profession for the excellent work he does, and he talks rough to the kinds of anthropologists who sin by his standards, not because he hates anthropologists, but because he's trying to educate them all to his standards. I have not discussed this with him, but to another Lakota anthropologist who was berating anthropologists collectively, I asked, "If you feel that way, why are you an anthropologist?"

"Because," she said, "I want to be an anthropologist more than anything else in the world."

Most of us feel that way.

Clifton Amsbury

786 Amador St.
Richmond, CA 44805

Dear Mr. Baen,

I have a question to pose which I think science fiction readers (and authors) might find interesting and worth discussing. My question is this: What skills, training, attributes, aptitudes, etc., will be required of a member of the first lunar colony?

I'm a senior in high school, and I, along with several friends, have been wondering whether I have the interests and capabilities required. My friends (other high school students) and I have talked about many aspects of this already, such as what would be the best age, and whether a military background is necessary.

I've been enjoying *Galaxy*'s increasingly better stories, and Dr. Pournelle's column is always worth the price of an issue by itself.

Steve Levin

733 19th St.
Santa Monica, Calif.
90402

Good question. Clearly, however, the answer will depend on the nature of the colony (or colonies) in question. For example, a pure-research oriented establishment would require a very different skills mix than would a manufacturing complex than would a construction site devoted to hoisting up mass to the Lagrangian Points than would a military base. Perhaps your best bet would be to familiarize yourself with NASA's requirements for payload specialists as a first step. And don't miss the March '77 issue of

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Galaxy; *Dr. Pournelle is going to answer your question at length!*

Dear Sir:

From all indications, the most significant aspect of *Galaxy* (apart from exemplary editing) is Jerry Pournelle's column. By Crom, this fellow has a way of inspiring both strangely tangential thoughts and bladder bursting fear.

"Lasers, Grasers, and Marxists", did both. After changing underwear, I did some thinking about our present American-Soviet position. If they've got any logic to them at all, the Soviets have no intention of obliterating the United States. For all our faults and many shortcomings, dear old Uncle Sam still has an economy and an agricultural technology that is bolstering the entire world. Simply put, the Soviets would starve.

Of course, this all depends on the maintenance of our present state of free enterprise and developing, within the next generation, an alternate energy source.

Sincerely yours,
Gary L. Day

Dear James:

In the view of some physicists today, the basic philosophy or current popular interpretation of special relativity leads to absurd and self-contradictory consequences and therefore to an illusionary physics. This is becoming clearer every day as physicists invent theories of black holes, claiming that they are gateways to seemingly occult dimensions, teleportation, time travel, and God knows what. Ironically, these are the ultimate consequences of the relativity philosophy; either we believe them as literal realities, or question the philosophical basis of special relativity by asking whether we have been mislead to illusion by illusion.

Probably the most physically unrealistic and self-contradictory concept in special relativity is the increase in rest mass m with velocity. Relativity philosophy interprets this increase literally rather than apparently or illusionary. Relativistic mass $m' \rightarrow \infty$ has been confirmed for bodies accelerated by systems *at rest* S (the increase in m deriving from the energy of accelerating fields at rest with S); it is *not* logically confirmed when the means of acceleration moves with the system in motion S', as with space ships. If the two cases are physically equivalent, where does the increase in m come from in the latter case, as viewed by S??? That is, how, without violating energy-mass conservation, can m' become 2m, 3m . . . ? Shall we claim, implicitly as relativity does, that the body in S' creates its own mass, or admit self-contradiction?

If S' considers himself at rest, justified by the principle of relativity, and S (at rest relative to the universe) to be in motion, S' OBSERVES THE WHOLE UNIVERSE, AND EVERY STAR SEPARATED BY MILLIONS OF LIGHT YEARS, TO LITERALLY AND IMMEDIATELY INCREASE IN MASS; EVEN DESPITE THAT IT IS *NOT* THE PHYSICAL UNIVERSE WHICH IS BEING OBSERVED, BUT ITS *IMAGE* AS IT EXISTED MILLIONS OF YEARS AGO!!! Relativity confuses images and observations of a thing with the physical thing itself.

Because S and S' are not physically connected, except for receiving light images of each other, it is *observations* of *images* that are made, not *measurements* detecting physical changes were S and S' physically connected, as in the case of S' accelerated by a rest system.

No natural particle or body has been found to exceed light velocity because they were accelerated by rest systems; and even if they could we would not detect them because no known detector can detect something moving faster than the light the particle emits.

Twenty-first century star trekkers will shake their heads in wonderment as to why twentieth century physicists were so monumentally mistaken as to believe the relativity philosophy; to assume that the energy, mass, length, and time dimensions of a star ship can, in reality, literally depend on the velocity of a stream of photons; and to misinterpret a functional (mathematical) relation between them for a literal causual one.

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Truthfully Yours,
A.H. Klotz

Physics Research
39 Simon St.
Babylon, N.Y. 11702

Dear Jim,

I was fascinated by Robert Hawkins' letter in the July 1976 issue about my chapter on "First Contact . . ." in *Cultures Beyond the Earth*. He seems to have a fine sense of disregard for facts and logic.

I admit that I occasionally suffer from the author's syndrome of inference, assuming knowledge the reader may not have. One problem was the omission in the book of the following sentence:

> "In a way,. . .the whole idea of detecting a superior technology by its waste heat is absurd. It is a little like trying to analyze another culture by its garbage. *Not overly reliable, but a start.*"

I am quite familiar with the archaeologist's love for middens. However, archaeology only *infers and extrapolates* a culture from its physical remains. These remains give us a great deal of information about the implements that were used, but very little about such things as family organization or moral beliefs. Waste heat from interstellar societies and garbage from terrestrial societies are merely *physical indicators* of their existence; alone, they are insufficient to analyze a culture. "Culture" is not a geographic concept.

A classic example for my point may be found in "Digging the Weans," by Robert Nathan, which appeared in Judy Merril's "Best of the Year" collection, *SF 57* (Gnome Press, 1957). Although fiction, it illustrates the fallacy of the archaeological "educated guess."

I would also like to remind Mr. Hawkins of the origin of the "LGM" pulsars—a prime example of the misinterpretation of electromagnetic "garbage."

I recommend an excellent book by Robert C. Dunnell, *Systematics in Prehistory* (Free Press, 1971). Rather than accepting the old school of archaeology "which viewed itself as doing ethnographies of dead peoples" (p. 3), he draws on the new school's distinction of function: "the technical recovery aspects of the field will herein be called archaeology, and the academic discipline . . . referred to as prehistory." (*Ibid.*)

Prehistorians do not study "culture" or past "societies" or "man's past." The only tangible phenomenon is the artifact. Confusing the means of explanation (culture, society, etc.) with the phenomena to be explained (artifacts) only results in inconsistency and untestable conclusions.

I take umbrage at Hawkins' arrogant dismissal of my statement on evolutionary timescales (p. 45). Perhaps my esteemed critic believes I fabricated the numbers because they sounded impressive? It may be that no one ever bothered to inform him that those little numbers suspended at the end of the sentence indicate a footnote. In this case, the source was P.H.A. Sneath's *Planets and Life* (Funk and Wagnalls, 1970), p. 155.

Any biology text or encyclopedia will tell you that primitive plant and animal life evolved during the early Pre-Cambrian era, over 3.2 billion years ago; birds and mammals began to evolve from reptiles around the time of the early Mesozoic (Triassic period), approximately 200 million years ago. Don't take my word for it: confirmation for these datings may also be found in Shklovskii and Sagan's *Intelligent Life in the Universe* (1966), pp. 221-224 and 227; L.E. Orgel's *The Origin of Life* (1973), pp. 26-30; and Cyril Ponnamperuma's *The Origin of Life* (1972), pp. 121-130. Need I go on?

If indeed, as Robert Hawkins suggests, Jerry Pournelle dissected *Cultures Beyond the Earth* "with one hand in his back pocket," I would not be surprised. Jerry is quite competent at both science fact and fiction.

But considering the content of his letter, I hate to think where Hawkins had *his* hand.

Regards,
Donald K. Stern

Box 5143
Seattle, WA
98105

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Dear Mr. Baen,

Having read Alter Ego's impassioned plea for a by-line (and mentioned on the cover too!), I must take pen in paw and say I think it's a great idea. Dick Geis is readable but Alter is more. He's impassioned, venemous, prejudiced, etc. All the things that make a columnist good reading. Couldn't you just let him have the magazine?

Yours,
Cathy Greywace

6039 Highland
Dearborn Hts., MI 48127

Editorial reply:
Sputter, sputter!

Dear Dr. Pournelle,

The May '76 *Galaxy* was my first look at *Galaxy* in some years; I bought it for the Zelazny serial, which I'm desperately trying to avoid starting until part III hits the street, but in the meantime found that the rest of the mag was quite good. Mr. Baen is entitled to a good scratching behind the ears; he seems a very competent editor.

However, I'm writing you. Your article on the O'Neill colonies was quite interesting, but more so was your apparent philosophy behind it. It is really tremendously encouraging to find the Space Cadets coming back out of the closets we were all driven into in the late 1960's. This letter will be too short to have much rational content, as I have to get notes off to NSI and the L5 society, but I wanted to thank you for bringing them to my attention.

Sincerely,
Daniel D. Villani

508 Foruth St.
Manhattan Beach, CA 90266

The Editor replies:
I am not a panda!

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